JOURNAL OF GAS LIGHTING, WATER SUPPLY, &c.

EDITOR & PUBLISHER: WALTER KING. OFFICE: 11, BOLT COURT, FLEET ST., LONDON.

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EDITORIAL NOTES—GAS, &c.

The Statutory Gas Companies' Bills.

IT is a sign of the times that many Gas Companies are extending their territories, and annexing, by purchase or by the process of amalgamation, those of smaller supply undertakings, together with their works. When such companies were originally established, their centres of operation were separated by rural conditions that did not invite the spending of capital in providing a long connecting-link. But Time has changed the conditions. The natural order of life is expansion. The expansion of population and of towns and the lengthening of gas-mains (among other public systems) have reduced the open space between the supplies of large gas undertakings and small, or brought them almost to a possible point of conjunction; and what is more natural now than that there should be union. For their size, the small works are efficient; but compared with the larger works, they are inefficient, and there are not in their limited circumstances opportunities for economy in their running. The policy of centralization is ploughing forward, and justifying itself. There are many examples. Croydon is one of them. Carshalton and Caterham have been annexed by that Company; and the two small gas undertakings have been absorbed. The consumers have gas to-day at a lower price than ever before, the shareholders have better dividends, the market value of their stocks is higher, economies in management have been realized, and the larger business allows, too, of purchasing and manufacturing economies. A feature of the Bills under notice to-day is centralization. The Bromley Gas Consumers' Company are proposing the absorption of the Crays Company; the Derby Gas Company, of the Belper undertaking and a smaller private works; and the Draycott Company (who are submitting to Parliament the asserted agrarian outrage of the Long Eaton Gas Company), of the Castle Donington works.

Points of general interest in these Bills are not many. Matters that were novel two or three sessions ago are to-day commonplace. In respect of illuminating power, the general rule is 14-candle gas, with modern testing clauses; but two companies—the Garw and Ogmore and the Rhymney and Aber Valleys—are asking, as are some of the promoters whose Bills were noticed last week, for 12-candle power gas. The Bromley Company are requesting the half-candle margin before any penalty is suffered. There is no reason why the Company should not enjoy the latitude as well as the Metropolitan and the South Suburban Companies. An innovation appears in the Bromley Bill. Disuniformity exists in police court "law" as to the ownership of money in prepayment meter boxes. In the Bromley Bill it is proposed to settle the matter, so far as this Company are concerned, by enacting that the placing of money in prepayment meters shall not operate as a discharge to a consumer in respect of gas supplied to him in the event of subsequent improper removal or theft occurring of such moneys. Like the Tottenham and other companies in the last session or two, the Bromley Company desire authority to supply power-gas, which supply is divested of the restrictions applying to illuminating gas. The old public lighting clause puts in an appearance again in the Gosport Bill; the Company contemplating its amendment in the usual manner by inserting "for lighting purposes" after the word "consumer." In the Llanelly Bill, the old 10 and 15 per cent. clause is introduced; but, on the other hand, the Draycott Company are intending to take advantage of the recent modification by the authorities, and extend section 13 of the Gas-Works Clauses Act 1847, and repeal the discounts clause in the Company's existing Act. The Llanelly Company are saddled with an ancient power to the local authority to appoint one member of the Company's Board. The Company have found this both inconvenient and objectionable, and ask for its repeal. With the spread of municipal trading, there is greater reason than ever why such an abnormal power should not be continued in the hands of the local authority.

Sulphate of Ammonia.

PROMINENCE is given in this issue of the "JOURNAL," to the manurial and commercial values of sulphate of ammonia by two reports—one on the Sulphate of Ammonia Committee's interesting and successful manurial experiments at the Irish International Exhibition in Dublin last summer; and the other, the ever-informative annual report by Messrs. Bradbury and Hirsch, on the trend of the sulphate of ammonia market last year. Touching first the Sulphate of Ammonia Committee's report, we look for the spread of an excellent influence from the demonstration which they made at the Irish Exhibition. Through the plots, upwards of 10,000 agriculturists passed; and the visitors from abroad who were welcomed there seem to have embraced representatives of almost every nationality under the sun. There is therefore ground for hoping that much good will accrue from the demonstration to the fertilizing commodity with which the gas industry is intimately concerned. In propaganda work in the interests of sulphate of ammonia, notwithstanding its superiority in manurial properties, there are cross under-currents which make headway difficult. It is inexplicable, but the fact remains, and is more and more impressed upon notice, that, when the subject of artificial fertilizers is treated upon in the non-technical Press, nitrate of soda is almost invariably cited as "our source of nitrogen," to the total exclusion of sulphate of ammonia, as though the latter was a quite unimportant article and unworthy of any notice when considering available supplies of nitrogen on broad lines. Yet, as a matter of fact, the amount of sulphate of ammonia produced in the United Kingdom is more than sufficient to supply our home requirements, now or in the future, without having recourse to a single ton of imported nitrate. Moreover, it can be safely claimed that sulphate of ammonia is at least as efficient as nitrate in its manurial properties; and it is, in addition, far cheaper and more economical. At present market prices, the unit values of nitrogen in the two fertilizers may be taken to be about as follows: Nitrate of soda, at £11 per ton is equal to 14s. 2d. per unit of nitrogen; sulphate of ammonia at £12 per ton is equal to 11s. 10d. per unit of nitrogen.

Turning to the report upon the results of the experiments, recollections of the past year are not yet so dim that readers will not recall the unfavourable conditions which prevailed for such experiments as these, especially during the earlier stages of growth. Considering this, the results may be regarded as highly satisfactory, and another signal proof of the advantages to be derived from a moderate and judicious application of sulphate of ammonia. Whether we look at the results for potatoes, mangels, swedes, rye grass, or barley, the same tale is told—heavier crops from a given area. The report gives the figures clearly; and they do not therefore require pointing here. The opportunity, however, may be taken of reminding gas managers all over the United Kingdom of the beneficial work the Sulphate of Ammonia Committee are doing. They are operating in the interests of all British makers of sulphate of ammonia; and, this being so, those makers who do not support the Committee are receiving benefit without contributing to the expense of producing it. We ask that makers should consider this matter, and consider it favourably, and at once become contributors to the Committee's funds. The individual outlay is small, and represents a trivial tax on the cost of production. In their report Messrs. Bradbury and Hirsch ask their readers to imagine what the effect of a shortage of supply of nitrate of soda would have upon the value of sulphate of ammonia. There is nothing visible that suggests a shortage of nitrate of soda; but the Sulphate of Ammonia Committee are doing the next best thing, and that is working to capture business

held by nitrate of soda or open to that fertilizer equally with sulphate of ammonia.

Though there was nothing very remarkable about the sulphate of ammonia market last year, the report of Messrs. Bradbury and Hirsch shows that the trading was in many respects satisfactory. True, the average price—£11 15s. 8d.—was somewhat lower than has been the case since 1901, and 1s. lower than it was in 1902. It is notable, however, how small were the fluctuations of price during the year. On the other hand, the extra production of the year was more than counterbalanced by the increase in the exports. The total exports last year, it is found, were 230,537 tons, or 29,081 tons in excess of 1906; while the estimated total production of 316,000 tons was 27,000 tons in excess of that year. The figures as to production with which Messrs. Bradbury and Hirsch supply us grow year by year increasingly interesting. The yield from gas-works last year was 162,000 tons, which was an increase of 5000 tons. The increases from other sources were: Iron-works, 1000 tons; shale-works, 2500 tons; and coke and carbonizing works and producer gas plants, 18,500 tons. The last figure is significant when contrasted with the 5000 tons increase from gas-works. Sulphate of ammonia production, in fact, from coke and carbonizing works and producer plants, is making rapid strides; and the total from this source—81,000 tons—is now precisely one-half the gas-works yield, whereas in 1902 the respective positions were 23,500 tons and 150,000 tons. And greater contributions still to the total must be expected from these competing sources with the new and reconstruction work that is going forward. As to the future, there is nothing to lead us to anticipate there will be a shrinkage in the demand for nitrate of soda; but nevertheless Messrs. Bradbury and Hirsch regard the outlook for sulphate of ammonia as not by any means unpromising. In their view, it seems likely that the price of nitrate of soda will be maintained at £11 5s. or £11 10s. per ton over the spring months; and if this should prove so, then anything under £12, or even £12 itself, per ton for sulphate of ammonia is absurd, and there is bound to be a reversion to the use of it for every purpose for which it can be employed. This encourages hope.

Views that Require Modernizing.

THERE are occasions when it is much easier to impute than to refute; but that is not so in an instance with which we are now called upon to deal. In the last two issues of the "JOURNAL," there has been noticed a report by Dr. James Kerr, the Medical Officer to the London County Council Education Committee, on the artificial lighting of school-rooms, in which report there are certain statements reflecting upon gas lighting, which may be very mischievous if they are not challenged and controverted. The portion of the report dealing with electric lighting has not been noticed in the "JOURNAL;" but our electrical contemporaries have made use of the statements appearing therein. Among them is this singular declaration: "With an inverted bunsen "burner, the combustion is imperfect, and noxious fumes "escape to a much greater extent than with erect bur-"ners." It would be interesting to know by what or whose authority Dr. Kerr advances this statement. If he has established its truth by personal trials, we should be considerably obliged to him if he would give us some account of his investigations into what we at present take leave to regard as something phenomenal. We should like to know how the trials were conducted, and the absolute results, as otherwise the bare declaration can only be characterized as positively absurd. Of this we are sure, that many makers of inverted gas-lamps would be perfectly willing to demonstrate to Dr. Kerr beyond all manner of doubt that the combustion of their burners can be perfect, and that the "much "greater" escape of "noxious fumes" from such burners is a figment of the imagination of the worthy doctor.

There are other statements in the report that may be associated with the one to which attention has been called. For instance, we read that "the rapid deterioration of the "atmospheric condition from gas lighting has been stated "in previous reports on ventilation;" and, again, with gas "the fewest possible number of burners is desirable, for the "more burners the worse the atmosphere." We take it that Dr. Kerr, as Medical Officer to the Education Committee, has made it his duty to see that the ventilation of the schools is of a proper and adequate description; and, if he has done so, then under such conditions gas lighting has been found by other eminent observers to be an aid and not a drawback to the maintaining of a sanitary condition of the air, whereas no such assistance is rendered by electricity. Dr. Kerr writes in a manner that would almost lead the listless to suppose that artificial lighting was a requirement of the whole time that school rooms were occupied; whereas, other than on foggy and dark days, there is little occasion, in the elementary schools, to resort to artificial illumination, except may be for an hour or so in the afternoons for two or three weeks in the depth of winter. Of course, there are the evening winter classes, which are only attended by boys and girls beyond the age of the daily scholars. The hours of artificial lighting are therefore comparatively few; and, moreover, the incandescent burner itself has produced a vast difference in the consumption of gas for the light afforded in contrast with the flat-flames of a day long since past. We are somewhat afraid that Dr. Kerr was labouring, when he wrote his report, under the deep impressions and rooted convictions received and formed in days when flat-flame lighting was general in the schools of London, and by (it is surprising to learn) the retention in many of them of the old flat-flame lights right up to the present day—a retention that has continued a deplorable state of wastefulness and inefficient lighting. Dr. Kerr himself shows what bad distributors of light for school work the old flat-flame burners are, and many of us have painful confirmatory recollections. He also shows what an excellent distributor of light the incandescent burner is (with proper reflecting globe) for desk work; but he does not give to the incandescent burner all the credit he might do for, in addition, saving expense and improving the atmospheric conditions, compared with the days when flaring gaslights and incomplete combustion of gas were the accompaniments of negligence.

There is one statement in the report which shows grudging praise or incomplete knowledge. "Although," the report says, "the gas consumed with the Welsbach burners was no "greater, perhaps less than that burned by the fishtail "burners, the desk illumination was increased nearly three-"fold over the whole room [in which the test was made]. "With the naked gas-jets, the minimal [10 metre-candles] "desk illumination was obtained over only a small part of "the room." There were four flat-flame gas-burners in this room, and Dr. Kerr states that it would require at least four more to obtain minimal desk illumination. It may be taken that the four flat-flame burners were consuming an average of 5 cubic feet, or 20 cubic feet in all. If eight had been used to get minimal illumination, they would have consumed 40 cubic feet of gas; while with the four incandescent "C" burners, with which "the illumination never fell below 10 "metre-candles," the consumption of gas was probably not more than 3½ cubic feet each, and yet we guarantee that even the eight flat-flame burners would have fallen far short of the illumination afforded on the desks by the four incandescents. For this greatly reduced consumption of gas, Dr. Kerr does not give incandescent gas lighting credit in his report. But we find it strikingly brought out, in a report issued in the early part of last year, by the Architect to the West Ham Corporation schools. That gentleman stated that in 35 of the Council's schools fitted with incandescent burners, there had been, in the Christmas quarter of 1906, as compared with the corresponding quarter of 1905, a saving of nearly a million cubic feet of gas, notwithstanding that there had been one more night school during the winter, and numerous additions made to the gas-cooking appliances. Testimony of this kind is of much more value than Dr. Kerr's inconclusive remark, "Although the gas consumed with the Welsbach "burners was no greater, perhaps less," &c. However, by incandescent gas lighting, the lessened volume of gas used is accompanied by a greatly enhanced and well-diffused illumination.

This subject of the lighting of school-rooms (the importance of conclusions affecting which is heightened by the fact that what is true of school-rooms is true in a large measure of other places of public assembly) is one that has been studied by many qualified men; and their conclusions do not all coincide with those of Dr. Kerr. We have heard before, as we hear again, the platitudes that the gas-burner "consumes "the air," or "robs it of its oxygen." Only last spring, we published the results of researches into the question by Mr. N. W. Gifford, the General Manager and Superintendent of the East Boston (Mass.) Gas Company; and in the account of his findings he stated that the requirements of school-room ventilation demand 50 cubic feet of air per minute for each pupil. As 30 cubic feet are said to be necessary, there

is a margin of 20 cubic feet per minute; and he calculated that, in a case with four gas mantles in use, the air robbed of its oxygen by the burning gas was about 2 cubic feet per minute, or one-fourth of 1 per cent. of the surplus air in rooms of the size of the one in which the experiments were carried out! And Dr. Bunte, of Carlsruhe, too, has pointed out that, with the ordinary upright incandescent burner, about 3 volumes of air enter the mixing-tube of a burner to 1 volume of gas; while when a burner is inverted, the air entering the mixing-tube is naturally reduced to 2 volumes to 1 of gas. There is here something more positive to go upon than the loose and fatuous statements so common as to depreciated and contaminated atmospheres where gas is employed.

In more than one place in the report, Dr. Kerr mentions the healthfulness, and freedom from consumption of air and production of fumes of the electric light; and we are hoping that he will now see good and just cause for modifying and modernizing his views regarding gas lighting. But he does not let electric lighting have a "walk over." There is a common complaint in the electric-lighted schools of a want of light, and of sudden and total failure. So much impressed is he as to the danger in public institutions of sudden extinctions of light, that he refuses to recommend electric lamps for passages and stairways. It may be suggested, too, that, in the winter time the warmth of the gas-lights is not an undesirable thing in the large school and class rooms; and the question of the eyesight of children should not be neglected. A dim light on one's work is hurtful to the eyes; but to strain the eyes over one's work, and then to look up at glowing filaments, is very harmful indeed. We do not forget what Dr. Allan Wilson, the "Lancet," and other authorities say on the subject. There is another drawback to electric lighting—that is its cost, which Dr. Kerr places at only 1·7 times that of gas. It is interesting to note that this is based on estimates derived from a dozen schools during 1905. But as we read of the prevalence in the schools still of flat-flame burners (though Welsbach fittings are rapidly supplanting them "with excellent results"), the narrowness of the economy, if Dr. Kerr has taken the light-for-light basis of comparison, is quite understandable. Between the gas consumption of the flat-flame days and now there is a vast difference, as the figures already cited from West Ham exhibit. Mr. Harold E. Copp, in his paper before the Institution of Gas Engineers last June, also told how the substitution of flat-flame burners by inverted burners in churches, public buildings, and factories had in many cases in West Bromwich effected a reduction in the consumption of gas varying from 50 to 75 per cent. In the annual report of the Camberwell Borough Council, the lighting of the Central Library is mentioned; and by using 24 inverted gas-burners in place of electricity in the octagonal reading-room, there have been savings which have recouped the expense of making the alteration, and left a balance of £32 2s. 5d. in favour of the new system—in other words, an approximate illuminating power of 960 candles has been obtained by gas for £11 10s. 5d., as compared with 656 candles by electricity at £66 8s. 5d. In the paper previously referred to, Mr. Gifford gives a cost of 2 c. per hour for lighting by incandescent gas-burners the schoolroom in which he made his tests, as against 10·40 c. by 16-candle electric lamps.

In fairness, we must not conclude without saying that Dr. Kerr's report contains, besides aspersions, some useful hints on lighting schoolrooms; but we do claim that several of his remarks require to be revised in the light of present-day experience.

Flame Arcs for Street Lighting.

READING the "Electrician" article on street lighting by flame-arc lamps in the City, there are more matters worthy of attention than the single one of illumination to which we devoted attention last week. It is seen that the lamps burn "from sunset to sunrise;" and that it is probable the price offered per lamp will be £17 10s. per annum on a seven years' agreement—this including the provision, erection, and maintenance of the lamps by the Charing Cross and City Companies free of any additional charge to the Corporation. These statements taken together are interesting, and rather emphasize the feeling of doubt that the Companies are not undertaking this lighting as an ordinary commercial transaction with the view to profit, but purely for such value as it will possess as an advertisement, and to brighten up their tarnished escutcheon. They propose to shoulder the whole capital cost, to provide the interest on that cost, to bear the expense of the labour and materials involved in erection, to repair and renew the lamps, to supply them with current and carbons, and to provide the labour for re-carboning and cleaning—and all for £17 10s.! In the case of the Gilbert lamps, our contemporary states that the capital cost is £9; but this does not include anything for erection, wiring, &c. We will take 10 per cent. on the £9 for the replacement of lamp capital for renewals at the end of the life of the lamps; and that amounts to 18s. a year. Five per cent. interest on £9 is 9s. The lamp manufacturers offer to undertake the maintenance of the lamps at 10 per cent. per annum on their capital cost. That is another 18s. a year. Before calculating the other figures, the statement that the lamps burn from sunset to sunrise has to be considered. To take round figures, the hours between sunset and sunrise in the year number 4300. But take 4000 hours; and we think it will be admitted that in that time one of these 11-ampere lamps will use (shall we say?) 2442 units of electricity. Assuming that only the low rate of 1d. per unit is charged, 2442 units would work out to £10 3s. 6d. [The last returns in the "Electrical Times" give the public lighting charge of the Charing Cross Company at 2·46d. per unit, and of the City Company at 2·42d. per unit!] Again, it is said that the cost of carbons per lamp-hour is for the Gilbert lamps 0·15d. At this rate, in the 4000 hours the cost of carbons would amount to £2 10s. Labour for re-carboning and cleaning may be put down at £2 5s. per lamp per annum, which is a modest enough charge for the work—and night work too—in London. We admit that these are estimates, but we have set the figures out so that all can see they are bare costs. The total of the items is £17 3s. 6d.; and electricity is only charged at 1d. (instead of about 2½d.) per unit, nothing is allowed for incidentals, and nothing for the cost of installation. The cost of installation for the lamps in Cannon Street, with all the wiring and labour involved, is not a negligible expenditure; and it would have been more if standards had been employed.

The calculations as to capital, maintenance and carbons, and the duration of lighting, are all based upon the information given by our contemporary; but the figures do not bear out other published costs of similar lamps. As we have recently pointed out, Mr. A. Lindsay Forster, in a paper before the Birmingham Section of the Institution of Electrical Engineers, gave the following figures for four 9-ampere flame arcs burning 1000 hours (which would be practically the same thing as one lamp burning 4000 hours): 2000 units at 1½d., £12 10s.; chemical carbons, £4 10s.; wages, £2 3s. 4d.; and repairs, £2 8s.—total, £21 11s. 4d. There is nothing allowed here for capital charges, interest, and renewals; and the lamps are 9 and not 11 ampere ones. It is clear from this that, in the estimate we have made for the City lighting (without, be it borne in mind, charging anything for installation and materials), the figures are cut very fine. The Oxford Street lighting is being charged at £20 13s. 5d. (half the lamps being switched off at midnight), without capital costs; and at Hastings £20 is charged, also without capital costs.

There is a point about which further explanation would be interesting, though it is not a matter of very great importance. The "Electrician" says the Cannon Street lamps burn from sunset to sunrise, and are carboned between 2 a.m. and 3 a.m., so that no inconvenience is caused to traffic. Seeing that the lamps burn until sunrise, and the earliest the sun will rise this year will be at 3.44 a.m. in June, it is difficult to see how the lamps can be carboned between 2 and 3 a.m., unless all the lamps on a circuit are extinguished specially for the purpose.

In the Rear of the Rating System.

Only labouring under the strongest provocation, we are sure, would Sir George Livesey have published the letter which appears to-day in our "Correspondence" columns (p. 111). When the subject-matter of the letter is considered, and the figures in the table are compared, the fullest justification for the course he has taken is found exposed on the surface. Many are the times that Sir George has been heard protesting against the enormous variations in the valuations of property by the rating experts on opposite sides; but the variations alluded to are relatively small contrasted with those in the assessments by certain men of the value of their personal services and time. The part of Sir George's letter that refers to salaried officers

fighting against their own ranks, and against the industry by and through which they live and thrive, is a matter to which greater general attention will be drawn by abstention from remark on our part. It is an interesting disclosure that Sir George incidentally makes in his letter, that Companies other than the Ipswich were associated in submitting the disputed question of prepayment meters, stoves, and fittings to the High Court for decision.

Preserving Widnes Gas Policy.

The gas and water profits appropriation clauses in the Widnes "Omnibus" Bill have created a sensation in Widnes the like of which is without equal in the borough's history. The clauses were criticized in our issue for Dec. 24; and after what was then said, we are pleased to find the gas consumers—industrial, ordinary, and prepayment consumers alike—presenting a compact body in opposition. The ratepayers' meeting to confirm the action of the Council in promoting the Bill has been held. The Bill has been approved, with the exception of the profit-appropriation clauses; and disapproval of these was pronounced in such a decisive way that no room for doubt remains that the people of Widnes have a sane preference for a bird in the hand rather than for two in the bush. In other words, they prefer the certainty of low-priced gas to any vague promises of rate relief which might or might not be materialized according to the fancy of the men forming for the time being the dominant party in the Council. All the eloquence of the property-owner pleaders for a departure from the old and successful policy failed to move the solid opinion of an overwhelming majority at the meeting. If ever there was a town in which there was not a tittle of justification for any part of the profits going to any other purposes than those of the gas undertaking and the consumer, that town is Widnes; for the consumers and they alone have met all the financial responsibility of the gas undertaking, and have put new capital into it. The reward is indisputably theirs. The profits, said one speaker at the meeting, should be put into the pockets of the whole community, and not into the pockets of a section. This is as bad as the ultra-socialistic doctrine of a division of property even among the "corner men" who are daily engaged in supporting the outer walls of the public-houses, and who do not move a hand to assist in the creation of property. Certain of the speakers, too, vied with each other in besmirching the good fame of the gas undertaking and its supply, which evinces the measure of their appreciation of the duty of jealously protecting the interests placed under their care. But what was said on this head was typical of the best street platform ranting; and the kindest thing to do is to wrap it up with much more of the irrelevant talk from the advocates of the profit-appropriation party, and drop it overboard into oblivion. However, on the main question, the voice of the people of Widnes has been effectively heard; and if a threatened poll is taken, we are confident the result will be such as will put to shame those who are trying to force a change in policy on a largely unwilling community.

Central Advertising.

In perusing a paper read by Mr. W. B. Woodhouse before the Leeds Section of the Institution of Electrical Engineers, we are reminded of the suggestion made by Mr. F. W. Goodenough in his paper before the Institution of Gas Engineers last June. He advocated a fund, contributed by gas undertakings, for the general advertising of the uses and advantages of gas; but the idea has fallen flat—gas undertakings evidently considering that as their business area is limited, so is the necessity for advertising to those limits, and by the means afforded within them. Mr. Woodhouse believes that the selling organizations of most electricity supply undertakings have been neglected; and he advises co-operation. In his opinion, a central advertising association would be of great value. Of course, one is apt to assume that the general public are familiar with all the advantages and developments of the use of gas and electricity; but Mr. Woodhouse rather fancies that the general public are more ignorant of the extent of electrical development than of the advances in any other industry of similar importance. This ignorance, he concludes, can only be removed by systematic advertising and circulation of information; and this, again, can only be properly carried out by a combination of supply authorities each contributing to a common fund for such work.

Miners' Hours and Coal Prices.

There was no ambiguity about the reply that the Home Secretary made last Wednesday to a deputation of the Mining Association of Great Britain, who were anxious to lay before him the views of that body as to the absence of all necessity for interfering with the hours of work in coal mines, and as to the prejudicial results of so doing. Mr. Gladstone heard all that had to be said; but his reply was the repetition of the determination of the Government that a limitation of hours there must be. The reply contains no reason why this should be; it does contain a reason why limitation should be avoided. "Of course," said Mr. Gladstone, "any limitation of the hours of labour in mines must have some effect in raising the price of coal." We hope that the Government will, in the settling of this question, show as great a solicitude for the welfare of the country's working people and industry generally as they are doing for the miners without cause over this hour-restriction question.

A Sapient Editorial Note.

Mr. Sydney F. Walker, of Bath, has been writing to the "Electrical Review" urging electricity supply engineers to devote their attention to the reduction of the costs of generation. Mr. Walker is wise in regarding with open mind his surroundings and the future. While he agrees that the new metallic filament lamps will reduce the cost of electric lighting, by reason of the greater efficiencies of the lamps, he asserts that electricity is at a great disadvantage in its struggle with gas on account of the much greater cost. What that "greater cost" is in his view is revealed in the statement that, except in special cases (such as those of the new incandescent lamps) with anything that may be done, either by electricity or by gas in lighting, heating, and power, the cost by gas is, on an average, only about one-half that by electricity. "The great convenience of electrical apparatus," he adds, "will always command a higher price for it. But there is a figure beyond which even the most enthusiastic users will not go; and there is still a wide margin between that and the cost of gas." He further predicts that the cost of gas will continue to steadily decrease, with the removal of the absurd restrictions under which gas has laboured for so many years. Well, it is a good thing for electricity that all its votaries are not trying to nurse themselves into the belief that gas is effete and without prospect, and only an object worthy of ridicule. The Editors of the "Review" append to Mr. Walker's letter this sapient note: "We do not agree with our correspondent's statements regarding costs." A silent tongue sometimes testifies to the prudence of its owner.

"Electric Wiring and Fitting for Plumbers and Gas-Fitters."—This is the title of a book by Mr. Sydney F. Walker (price 5s. net), which we have just received from Messrs. Scott, Greenwood, and Son. In his preface, the author states that he has written as a practical man to practical men, and hopes that the information he gives will enable plumbers and gas-fitters to avoid the disastrous mistakes that have sometimes been made in the past.

The Shoreditch Steam-Roller Case.—At the last meeting of the Shoreditch Borough Council, the Law and Establishment Committee reported the settlement of the claims arising out of the fatal accident in Hoxton, when a steam-roller crushed some gas-pipes and one person died in consequence. The matter gave rise to a claim for damages against the Gaslight and Coke Company, which was heard in the Shoreditch County Court on the 4th of November last, as reported in the "JOURNAL" next day. In connection with the accident, four High Court writs were issued against the Council; but we learn that these, together with the claim of the Company for damaged pipes, have been settled for the sum of £250.

Large Gas-Engines.—We learn from the Engineering Supplement to "The Times" that an interesting table, compiled by Mr. R. E. Mathot, of Brussels, has been published in the "Revue de Mécanique," giving the numbers and the horse power of the gas-engines recently manufactured by some of the chief European firms. The figures are as follows: Messrs. Crossley Bros., Limited, 57 motors, with an aggregate of 23,660 H.P.; Messrs. Ehrhardt and Sehmer, 59 motors, total 69,790 H.P.; the Otto Gasmotoren Fabric, 82 motors, total 47,400 H.P.; Gebrüder Körting, 198 motors, total 165,760 H.P.; Société Alsacienne, 55 motors, total 23,410 H.P.; Société John Cockerill, 148 motors, total 102,925 H.P.; Société Swisse, Winterthur, 67 motors, total 8620 H.P.; Vereinigten Maschinenfabrik Augsburg and Nürnberg, 215 motors, total 256,240 H.P. The mean power of each engine made by Messrs. Ehrhardt and Sehmer and the Augsburg and Nürnberg Companies is in each case 1200 H.P. It is stated that in one factory there are gas-engines representing a total output of 35,000 H.P.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 118.)

THE progress of things on the Stock Exchange last week was somewhat chequered. The opening was rather shy and doubtful; being still under the apprehension of troubles suggested in a section of the Foreign Press. But when it was found that the Continent was buying, matters took a better turn, and some markets improved. Tuesday was fair and free from disturbing factors until near the close, when the gilt-edged division was vexed at India appearing as a substantial borrower. Wednesday did not bring about any recovery beyond a rather better tone in Consols and the first-class group; while the appointment of a Receiver of an American railway largely held on this side the Atlantic was a new item of trouble. On Thursday, disappointment was expressed at the non-reduction of the Bank of England rate to a figure something more like market quotations; but by the close of the day more cheerful views prevailed. On Friday, the gilt-edged market was jealous of new issues; there being seemingly too many borrowers in a hurry to get in well on the first flow of financial recovery. Other lines, however, did very well—notably railways both at Home and in the West. But the best of it did not last through Saturday, and there was a marked disposition to take a profit where it could be taken. In the Money Market, there was an abundant supply to meet all requirements of short date, and discount rates were easier. Business in the Gas Market was brisk and animated, and the tendency was remarkably favourable. A glance at the list will show that there was an almost general advance of prices—amounting in some instances to an improvement of 4 and even 5 per cent. The accounts for the past half year will probably be satisfactory in general, notwithstanding that the exceptionally mild weather which prevailed up till Christmas diminished the consumption. In Gaslight and Coke issues, the ordinary was gay and active, with transactions ranging from 96½ to 98½—a rise of 1½. In the secured issues, the maximum marked from 87 to 88, and the preference 105. South Metropolitan gained 2, with dealings rauging from 122 to 124½. The debenture was done at 83½. Commercials were very quiet. The 4 per cent. made 103½; and the 3½, 102. In the Suburban and Provincial group, Bournemouth "B" was done at 161$\frac{11}{16}$, Brentford old at 245 and 246, ditto new at from 185 to 186, Bromley "B" at 87¼, Brighton original at 205 and 206, British at 40¼ and 40½, South Suburban 115½, West Ham 101½ and 102½, and ditto debenture 105 and 106½. In the Continental Companies, Imperial was strong at from 173 to 177, Union fetched 108 and 110, and European fully-paid 22⅜. Tuscan debenture was done at 99 and 99½. Among the undertakings of the remoter world, Bombay changed hands at 6 and 6½, Buenos Ayres at 11 to 11⅜, Monte Video at from 11⅛ to 11$\frac{5}{16}$, Melbourne 5 per cent par, ditto 4½ per cent. at 101½ and 101¾, Primitiva at from 6$\frac{15}{16}$ to 7, ditto preference at 5 and 5$\frac{1}{16}$, ditto debenture at 93, River Plate at from 13¼ to 13⅜, ditto debenture at 92 and 92¾, and San Paulo at from 13⅛ to 13⅜.

ELECTRIC LIGHTING MEMORANDA.

Retrospect and Prospect—The Electrical Share Market—Power Supplies and Powerless Prices—Further Declaration as to Lax Business Principles—Cooking and Water Heating—How Electric Street Lighting is Engineered at Hastings.

WITH the new year, there have been retrospection, introspection, and prospection in some of our electrical contemporaries. Over the, in electrical circles, well-known initials of "J. S. R."—the last of which signifieth Raworth—in an article (the scope of which may be described as above) in the "Electrical Times," wherein there is great lamentation, and the readers are bidden to "hope on, hope ever." Time was when the Electrical Future [capitals please] was appraised as a veritable gold mine; and according to "J. S. R." it has been so to the user, but to the digger it has been but little better than a graveyard. One of the causes for this, he attributes to the ignorance and apathy of Parliament. He deplores the financial failure of the underground and deep-level electric railways of London; and, for this state of things, he blames the good roads provided by the ratepayers, and not the shareholders of motor omnibus companies. As to lighting and other fields of electric supply, he acknowledges that the gas industry, under (we will let him go his way rejoicing in the belief) the stimulus of electric competition have improved their burners to such a great extent that the public has received the benefit. But (liberal-minded as he is) he sees no reason to object to this improvement, because every improvement, whencesoever it comes, is for the ultimate benefit of the public. But he does apparently see cause for some complaint that, as regards gas shareholders, the tenure is eternal, whereas, in the case of electric shareholders, the tenure is limited—in the case of the tramways to 21 years, and in the case of electric lighting to 42 years. "J. S. R." has not only the capacity for diagnosis, but he possesses the power of prophecy. The year, 1908, he asserts, ought to be a great year. But it will not be; it will be simply flat.

This being so, the prices of electricity companies' shares will not (though last week there has been a little more animation among them) be ramping in a great revival, which is badly wanted to attract capital. Our contemporary treats its readers to a review (by "An Insider") of the electrical share markets during last year. We all know about the general causes of depression in the stock and share market last year; and we also know something of the causes that have made electricity shares droop beyond anything that could be produced by general depression. Last year, for instance, among the Metropolitan Electric Supply Companies, of thirteen ordinary stocks and ten preference, there was only one Company's ordinary that showed a rise, and that was the Charing Cross £5 ordinary shares from 3¾ to 4. Several of the ordinary and preference shares are now below par. If prices are compared with two or three years ago, the decline that has taken place will be found to be very serious, and in large degree this is due to internal troubles rather than to the general depression in the stock and share market. A list we have by us shows the highest prices marked in 1905 by electric ordinary shares; and it is interesting to compare them with those ruling on Dec. 31 last. Brompton and Kensington, £5 ordinary, 1905, highest price, 10⅞; Dec. 31, 1907, 7½. Charing Cross, £5 ordinary, 8$\frac{11}{16}$, compared with 4. Chelsea, £5 ordinary, 7⅜, compared with 3¾. City of London, £10 ordinary, 13$\frac{3}{16}$, compared with 10. County of London, £10 ordinary, 10$\frac{5}{16}$, compared with 7. Kensington and Knightsbridge, £5 ordinary, 13⅛, compared with 8½. London, £3 ordinary, 2$\frac{23}{32}$, compared with 1¼. Metropolitan, £5 ordinary, 11, compared with 5½. Notting Hill, £10 ordinary, 15¼, compared with 10¾. St. James, £5 ordinary, 14⅞, compared with 8. South London, £5 ordinary, 4½, compared with 2⅝. The quotation of South Metropolitan £1 ordinary is not given in the list by us for 1905; but they now stand at ½. Westminster, £5 ordinary, 13$\frac{11}{16}$, as compared with 8¼. Through the depression last year, gas stocks and shares suffered in common with other departments, but previously they had maintained their high level. However, "An Insider" points out that the electricity market cannot be said to have presented many interesting features (he should have interpolated, excepting for shareholders) during the past twelve months—in fact, there has scarcely been anything to break the monotony of everyday markets, and the market has ceased to take life seriously. But "An Insider" does not look altogether on the dark side of things; and what a thrill of gratification must have passed through his electrical readers on catching sight of the remark: "Yet, through the whole of the severe depression, a certain number of the favourite debentures have been, more or less, continuously in demand." If debentures do not command respect, then certain it is that other ranks in capital will not do so. It is significant, too, that while the public have been shy to invest on a falling market, the market has been continuously subject to forced sales. Reviews and prognostications will certainly not do much to encourage that eternal hope which "J. S. R." suggests as the portion of the electrical industry.

The commercial aspect of electric power supply is a subject of everlasting interest to central station engineers, because outside their lighting business it promises, if not always in a really profitable manner, to help to bring up the deep valleys in the curves of output; and to succeed in lessening the depth of the valleys, never mind whether or not there is profit in it, is, in the eyes of the intellectual but uncommercial station engineer, an achievement which adds lustre to his professional reputation. Mr. W. B. Woodhouse has been treating upon the commercial aspect of electric power supply before the Leeds Section of the Institution of Electrical Engineers; but on that occasion there was much of the commercial aspect missed, but a good deal was said as to the capital cost of a so-many kilowatt station, and as to works costs. But that narrow aspect of the commercial position does not determine the costs that should be taken into consideration in fixing the price to be charged for the product. There is the question of distribution, maintenance, renewals, establishment charges, rates and taxes, and all incidental expenses, combined with the character of the load, to be brought into account. Mr. Woodhouse's argument was for centralization, as the best means of cheapening the cost of supply; and there are sound reasons to be advanced for this. Mr. Woodhouse, of course, had in mind the centralization of the production of electricity as in the case of power companies; but the power companies find that their distribution costs and losses are matters that take an imperious position among the factors to success or otherwise. Still practice has shown that the small generating station cannot produce electricity at a price sufficiently low to enable it to supply power users at a competitive price; and in such cases Mr. Woodhouse says as plainly as he need say it, that the power user can generate for himself at a cheaper rate than the small electricity station can supply him at. Competing with the small generating station, the user has no capital and working distribution charges to meet, and certainly he has none of the distribution losses. Among the hearers of Mr. Woodhouse, there was doubt—expressed particularly by Mr. H. Dickinson—whether power users with high load factors could not supply themselves as cheaply as they could be served from a central station. These opinions and the experience of the power companies will come in handily in any future parliamentary discussion of this subject.

Here the ordinary town central station is the one with which we come in chief contact; and it is found that these stations do supply power users at a competitive price. Mr. S. D. Schofield, in the discussion on Mr. Woodhouse's paper, corroborated this. But in his opinion—and it is one that has been expressed in similar terms over and over again in the "Memoranda"—many of these

undertakings are running too near the dividing-line between loss on the one hand and making a small profit on the other. Added Mr. Schofield: "In a number of places, power supply was given at a low rate, simply because they had a fairly good lighting load. He could name towns where rates had been quoted which, in themselves, were certain to result in a loss, and those rates were only possible because they were given at the expense of other classes of consumers." What reply have the station engineers thus charged with unsound commercialism to give to their accuser? It is true to say if a branch of a business cannot be separated from the rest and show a clear profit, then the branch is being worked to the injury of the other business. But let us leave the power for other day business. Mr. G. Wilkinson, of Harrogate, is apparently considering whether he cannot sell electricity specially for cooking purposes much on the same lines as power electricity. The wriggling of the electrician from off the beaten track of commercialism to get day business is singularly fascinating, not to say at times grotesque, to those who eschew diversity and other factors, tap the nearest house gas-pipe, and supply gas to cooking-stoves at the price charged for lighting purposes, and at that price the fuel is cheap. But Mr. Wilkinson believes that "if they can get electric cooking showing a diversity factor of anything like 4, they can afford to sell current at a price that would make the business financially successful." He warned gas companies who had considered the cooking business a monopoly that they will "be undeceived before long." So be it, fervently ejaculates the station engineer. Much, however, will have to happen before the electricians can enter on level terms in the competition. Electricity cooking apparatus is expensive, inefficient, and unreliable; and the special circuit and meter are costly, and are also factors to be considered before brag and threats supersede commonsense. If there was ever a really severe tussle for the business, think the electricians that the gas companies would not put in a discount meter, and supply gas at a price giving a service that electricity could not touch? Optimism we have been told is a tangible business factor; and Harrogate is to be congratulated on having an Electrical Engineer endowed with so much of this desirable quality. But there is another matter that Mr. Wilkinson has been going into. He has been looking into a scheme for the heating of 300 gallons of water per hour for two hours during the early morning each day. Steam was put altogether out of the competition; while gas worked out to £80 per annum, as against £50 for electricity! The capital outlay as between electricity and steam, was £160 for electrical apparatus as against £450 for steam (Mr. Wilkinson omitted the capital cost for gas). Now surely he does not expect anyone to swallow these figures without further information. At what price per unit and per thousand cubic feet are the electricity and gas respectively calculated; what gas apparatus was proposed for the heating; and what was its capital cost? If Mr. Wilkinson is proposing to charge a profitable price for his electricity, it would not be difficult to show that, both theoretically and practically, there is a flaw somewhere in his contention.

It is all very well for councillors to talk in unctuous tones of "savings" they are effecting in public expenditure when the so-called savings are merely a recession from a past unconscionable expenditure. The Hastings Town Council are effecting what is yclept a "saving" in the expense of the public electric lighting. And, verily, not before it was wanted, for Hastings occupied for long the unenviable and reproachful position of having the dearest priced electric street lamps in the country. Therefore, for the "savings" that are being effected, there is not so much credit due to the Council that they can afford, without inviting ridicule, to make a song about it. The public lighting has always been a source of monetary supply for the hard-up electricity concern. The Council, however, have converted the old arc lamps to flame arcs at a cost of £2133; but beyond this they have contemptuously bye-passed the Local Government Board, whose Inspector recommended that no loan should be granted for putting flame arcs up in Queen's Road and Cambridge Road—these thoroughfares being sufficiently and economically lighted by incandescent gas-burners. Nevertheless, the flame arc lamps have gone up; and their cost is being charged on the general district rate. The Local Government Board may some day seek for an explanation. If the protective power that the Board are supposed to possess on behalf of the ratepayer can be so easily over-ridden, it is not worth very much. But it is on the point of "saving" that there is present interest. It was stated at the meeting of the Council the other day that it was hoped to save considerably by the new lamps. Inasmuch as the cost of the old arcs was in the neighbourhood of £50, there is room for positive effect being given to the hope. But let the ratepayers not be deceived as to the extent of the reduction. The Electricity Committee are paid £20 per lamp per annum for these flame arcs; and it is understood that this includes current, maintenance, and repairs. We do not for a moment assert that, at this price, the Electricity Committee are making anything considerable out of the lighting; and of this we are equally certain—that Hastings cannot point to any material improvement in its condition as a result of adopting this expensive form of lighting in its streets. But this is important to the ratepayers: That £20 per lamp does not include the whole of the money that they are paying for the lighting. The street electric lighting has been transferred from the Electric Lighting Committee to the Public Lighting Committee; and on the Public Lighting Committee, there is certainly a working, if not an actual, majority of members of the Electric Lighting Committee. In the public eye, the street lighting is in the hands of an independent Committee; in truth, the Committee is so well leavened by the Electricity Committee, that practically the street lighting might as well be within the sole charge of the latter. The Public Lighting Committee pay the Electricity Committee the £20 per annum for the flame arcs, the Public Lighting Committee are charging the rates (over three years) with the £2133 for converting the whole of the arc lamps, and there are still the interest and sinking fund charges coming from somewhere—and where but the rates?—for the electric standards and old lamps. If all the charges that electric public lighting in Hastings to-day involved were added together, the £20 per lamp would be shown to be far from the whole; and the "savings" of a character not worth crowing about. But to return to the remarks made (when this matter was before the Council the other day) as to the lighting of Queen's Road and Cambridge Road. Alderman Langham made this statement, which is wealthy in wisdom, regarding the question of charging for the work of installation. He said, if the Gas Company were asked to do certain work for the Council, the Company would charge them for it; in the same way, the Electricity Committee charged for work done for the Council. But we would point out this difference—the Gas Company, in public lighting, cannot make work for themselves, whereas the Queen's Road and Cambridge Road scheme was engineered throughout by the Electricity Committee, who made their own custom. It is true the scheme passed the Public Lighting Committee; but there would be surprise in hearing that the Borough Engineer was consulted in the matter, although a Borough Engineer is, in municipal administration, the official generally responsible for the public lighting. But if the Public Lighting and Electricity Committees are able to bye-pass a Government Department, why should they consider a Borough Engineer?

GAS BILLS FOR 1908.

[Second Article.]

This week's contribution to the review of the Gas Bills for the coming session is devoted to applications for further powers by statutory companies.

The Bromley and Crays Gas Bill is an important one. It has for its principal object the authorizing of the amalgamation of the Crays Gas Company with the Bromley Gas Consumers' Company. The former Company are supplying gas in St. Mary Cray, St. Paul's Cray, North Cray, Foot's Cray, Chislehurst, Orpington, Farnborough, and Chelsfield—all in the county of Kent. Their issued capital consists of £80,278 of consolidated ordinary 5 per cent. stock. The Company have unexercised borrowing powers amounting to £19,517 of stock, and are entitled to borrow £121 and one-fourth part of the £19,517. The Bromley Company have now an issued capital of £104,000 of "A" ordinary 5 per cent. stock, and £165,700 of "B" ordinary 3½ per cent. stock. The Company have unexercised capital powers amounting to £95,172, and are entitled to borrow £1775 and one-third part of the unexercised ordinary stock powers. It is proposed that the amalgamation shall take effect from the date of the passing of the Act, and that the name of the amalgamated Company shall be the Bromley and Crays Gas Company. Mortgages are to be a charge on the united Company, and the insurance and reserve funds are to be amalgamated. The provisions of Bromley Gas Acts referring to illuminating power, purity, pressure, and testing of gas, and standard price and dividends, it is proposed shall apply to the amalgamated Company. Regarding the charge for gas in the Crays Company's district, it is suggested that for the first five years after the date of amalgamation, not more than 8d. nor less than 4d. per 1000 cubic feet in excess of the Bromley charge is to be made; for the next five years not more than 6d. nor less than 3d. in excess of the Bromley price; and, after the expiration of ten years, the price is to become uniform with that in Bromley. Provision is made for the creation, and the division among the Crays shareholders, of "C" ordinary 5 per cent. stock of the amalgamated Company to an amount equal to the consolidated ordinary stock of the Crays Company, subsisting at the date of amalgamation. As to the dividend on the "C" stock, the sliding-scale it is intended shall apply half-yearly. If the price of gas is above the standard of 4s. 6d. per 1000 cubic feet, the dividend will be at the same rate as that declared on the ordinary "A" stock of the amalgamated Company; and when the charge for gas is below the standard price, the dividend will be at the rate of 5s. per cent. less than the dividend on the "A" ordinary stock—provided that the dividend on the "C" stock is not to be reduced at any time below 5 per cent. per annum so long as the dividend on the "A" stock is at or above 5 per cent. The capital powers of the Crays Company are to be continued in the amalgamated Company; and it is proposed that the amalgamated Company shall be authorized to borrow (including the existing debenture stock of the Crays Company) up to one-third part of the "C" capital now proposed to be created and issued, as well as of the additional capital. Three of the Directors of the Crays Company are to become Directors of the amalgamated Company; and so the number of the Directors of the latter will be increased to ten. But it is provided that the first three vacancies occurring on the Board by death,

resignation, or vacation of office otherwise than by rotation, shall not be filled up, and the number of Directors after the third vacancy will again be seven. Those Directors of the Crays Company who do not become associated with the Board of the amalgamated Company, it is contemplated, shall receive a sum equivalent to seven years' of their annual remuneration calculated upon the average of the previous three years. Each of the Auditors of the Crays Company is also to be entitled to two years' remuneration. It is proposed that the Secretary of the Crays Company (Mr. W. B. Mimmack) shall be paid a retiring allowance of £300 per annum for life. Any other officer whose services may be dispensed with in consequence of the amalgamation will receive one year's salary and the agreed emoluments of his office as compensation. The standard illuminating power of gas to be supplied by the Company is that prescribed by section 30 of the Bromley Gas Act, 1879—viz., not less than 14 candles:

Provided that, notwithstanding anything contained in the said Gas-Works Clauses Act, 1871, or any other Act relating to the amalgamated Company, if the illuminating power of the gas supplied by the amalgamated Company shall be below such prescribed number of candles to an extent not exceeding ½ candle, the amalgamated Company shall not be liable to any penalty in respect of such deficiency, and that if such illuminating power shall be below such prescribed number of candles to an extent exceeding ½ candle, but not exceeding 1 candle, the penalty to which the amalgamated Company shall be liable in respect of such deficiency shall be not exceeding £5.

Regarding prepayment supplies, the following clause appears:

The placing of moneys in a prepayment meter by a consumer of gas shall not operate as a discharge to such consumer in respect of gas supplied to him in the event of any subsequent improper removal or theft occurring of such moneys from the meter on such consumer's premises; and the amalgamated Company may in any such case recover from such consumer gas rents and charges in respect of the gas supplied to him as recorded on the index of such prepayment meter at the price payable for the time being.

It is proposed that trammelling clauses, in the Gas-Works Clauses Act and in the Bromley and Crays Acts and in this Act, to the supply of power gas shall not apply to such gas, and authorization is asked to the Company supplying power gas, and making any charge in respect of it as may be agreed between the Company and power-gas consumers. Then follow the usual clauses as to power gas possessing a distinctive and readily perceptible smell, as to the gas not being supplied for illumination, and as to conforming hereafter to any regulations the Home Secretary may make in respect of the supply of power gas. All "dynamos, accumulators, engines, motors, batteries, machinery, and apparatus" let on hire by the amalgamated Company, though fixed to the premises, are safeguarded as the Company's property. [*Parliamentary Agents: Messrs. Rees and Freres.*]

Requiring further powers, the Dartford Gas Company are in Parliament. In the preamble of their Bill, it is recited that the authorized share capital is £74,400 in "A" and "B" shares, and £50,000 in new ordinary shares. The "A" shares are entitled to a maximum dividend of 10 per cent.; the others, to 7 per cent. Of £18,500 authorized to be borrowed, the Company have raised £12,083. They now ask for consolidation and conversion on a 5 per cent. basis; with distribution to present shareholders at the rate of £20 for each £10 "A" share and £14 for each "B" or new ordinary £10 share. The works require extension; and the Company propose to construct works on scheduled land now belonging to them and upon lands proposed to be acquired compulsorily. They also desire power to purchase up to 5 acres of land by agreement. Instead of suggesting binding themselves to a discount clause, the Company conform to the requirement of the authorities by the extension of clause 13 of the Gas-Works Clauses Act, 1847, in manner frequently alluded to. The additional capital sought is £75,000; and the Company request to be allowed to borrow (inclusive of the £18,500 authorized by the 1880 Act) one-third of the nominal amount of the consolidated stock and raised additional capital. Renewal, insurance, and reserve funds are provided for. The Company are proposing a standard illuminating power for gas of 14 candles, tested by the "Metropolitan" No. 2 burner and Harcourt's ten-candle pentane lamp. The usual prepayment clauses appear in the Bill. [*Parliamentary Agents: Messrs. Sherwood and Co.*]

The Bill of the Derby Gas Company is purely one for territorial extension and acquisition of neighbouring gas undertakings. The measure provides for a supply of gas to Milford, Holbrook, Heage Coxbench, Denby, Kilbourne, Horsley, Horsley Woodhouse, and Hilton—all being parishes and places adjoining the Company's present area of supply. Ratification is also asked to the acquisition of the Belper Gas Company's undertaking and of the private gas-works belonging to Mr. G. H. Strutt. The Belper Company have raised capital to the extent of £6000, and have also borrowed £2000. According to the agreements scheduled to the Bill, it has been arranged that the Derby Company shall, as part consideration for the transfer of the Belper undertaking issue to the Liquidators (Mr. Joseph Pym and Mr. J. Ferguson Bell) £14,600 consolidated stock of the Derby Company for division among the members of the Belper Company; and the Derby Company are also to take upon themselves the debts, liabilities, and engagements of the latter as existing on October 21, 1907 (the agreed date of transfer). A dividend at the rate of 10 per cent. per annum is to be paid in respect of the past half year. Out of the assets, the Derby Company are also to allow for distribution among the members of the Belper Company £600; being a bonus of £1 per share. To Mr. Strutt, the Company are to pay as consideration for the purchase of his property £7500 of consolidated stock. Provision is included in the measure by which the Mayor, Aldermen, and Burgesses of Derby may enter into, and give effect to, agreements with respect to carrying a coal conveyor or other similar structure across Ford Street in the borough, for the purpose of affording access between the existing works of the Company and the railways of the Great Northern Company (Derbyshire and Staffordshire lines) adjoining the street in question. [*Parliamentary Agents: Messrs. Dyson and Co.*]

The Draycott Gas Company have at present an authorized capital of £20,000, of which £10,000, called the original capital, consists of ordinary shares entitled to a dividend of 10 per cent. per annum, and the additional capital has been raised by the issue of £9200 preference shares entitled to a dividend of 5 per cent. per annum. The premiums make up the authorized capital. It is now proposed that the ordinary capital be converted into stock bearing a dividend of 5 per cent.; that the Company be allowed to raise additional capital not exceeding in the whole £50,000; and that authority be given to the borrowing of a sum not exceeding one-third part of the preference capital and one-third part of the nominal amount of the stock into which the ordinary capital is to be converted, together with one-third of the additional capital. But the most important part of the Bill refers to the recent competition of the Long Eaton Gas Company with the Draycott Company. The preamble states that, in the Long Eaton Gas Act of 1901, the Company were authorized to supply gas to Long Eaton, Breaston, Draycott, Risley, and Sawley. Since the incorporation of the Draycott Gas Company, the Long Eaton Company have had concurrent powers of supply over the greater portion of the area of supply of the Draycott Company; but the Long Eaton Company have only lately attempted to exercise such powers. They have laid mains in the area of supply of the Draycott Company, and are charging therein a lower price for gas than that charged by the latter, and considerably lower than the price charged by the Long Eaton Company to consumers not within the Draycott Company's area of supply, and "thereby and in other ways unfairly and improperly competing with the Company." Provision is therefore made for the repeal of the Long Eaton powers to the extent that they affect the area in which the Draycott Company are operating. The promoters also ask for an extension of their limits of supply; and they further desire power to purchase by agreement (dated Dec. 6 last) the Castle Donington Gas-Works. The first clause of the agreement provides that the vendors shall sell, and the Company purchase, the undertaking for the sum of £5647 10s. The provisions of the Draycott Company's Acts are to be made applicable to the extended area. Certain land powers are also sought. The standard rate of dividend on the converted capital being 5 per cent., the necessary change in the sliding-scale clauses in the Act of 1888 is made from 5s. to 2s. 6d. per cent. It is also proposed to repeal the discounts clause in the Act of 1888. Provision is made for a renewals fund. The standard illuminating power of gas is placed at 14 candles, tested by the "Metropolitan" No. 2 burner and Harcourt's 10-candle pentane lamp. The Company ask to be permitted to apply for an Electricity Supply Order. [*Parliamentary Agents: Messrs. Crowders, Vizard, Oldham, and Co.*]

The Garw and Ogmore Company have nearly reached the end of their money powers; and so they are in Parliament for replenishing themselves in this respect and other purposes. The Company desire that the limits of their supply shall be extended so as to include so much of the district of the Ogmore and Garw District Council as is not already in the Company's district of supply under their Act of 1891, and a defined part of the district of the Penybont District Council. The promoters seek confirmation for their lands and works situated at Pontycymmer, and authority to acquire, by agreement or arbitration, the existing public supply of gas from the private gas-works at Tondu belonging to North's Navigation Company, Limited. Additional lands are scheduled for works, and power is asked to the purchase by agreement up to 5 acres. The additional capital sought is £40,000, with one-third borrowing powers. The ordinary form of prepayment meter clause appears. The standard illuminating power is proposed at not less than 12 candles; and the "Metropolitan" No. 2 burner is prescribed for testing. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

The Gosport Gas Company have issued the whole of their authorized capital; hence their appearance in Parliament. In the Bill, the limits of supply are defined; and authority is requested to the charging for gas outside the urban district of Gosport and Alverstoke of not exceeding 6d. in excess of the price charged within the urban district. The lands now in possession of the Company are scheduled; and power to purchase by agreement not beyond 10 acres is asked. Provision is inserted in the Bill for the consolidation and conversion of the capital on a 6 per cent. basis; and power is asked to the raising of additional capital not exceeding in the whole £48,000. The dividend on preference issues is limited to 5 per cent. Including £12,500 already borrowed, the Company desire permission to borrow up to one-third of the nominal amount of the ordinary consolidated stock and of the issued additional capital. Provision is included for a renewals fund. The "Metropolitan" No. 2 burner and Harcourt's 10-candle pentane lamp are proposed for testing the gas; and certain antiquated clauses bearing on the testing of gas it is suggested shall be repealed. Regarding the

supply to public lamps, it is proposed to make a necessary insertion, in section 57 of the Company's Act of 1865, after the expression consumer, of the words "for lighting purposes." [*Parliamentary Agents: Messrs. Dyson and Co.*]

The incorporation of the Llanelly Gaslight Company took place in 1874. By the Act of that year, it was provided that the capital should be £50,000, divided into £2500 shares of the nominal value of £20 each, and that 150 of such shares should be called "original shares," and of the remainder 636 should be distinguished as "New Shares Class A," the balance as "New Shares Class B." The same Act provided that the profits of the Company should be applicable to the payment of a dividend not exceeding £5 per cent. on all the paid-up share capital; secondly, in payment rateably of a further dividend of £2 on the original shares and on the "B" shares, and, thirdly, in payment of a further dividend of £3 on the original shares. Borrowing powers were allowed to the extent of one-fourth of the capital. The whole of the capital has been issued, as well as debenture bonds to the amount of £12,500. The preamble of the Bill the Company are now promoting sets forth, in addition to the above particulars, that by the Act of 1874, the Local Board were empowered to annually elect and depute one member of the Local Board to be a member of, and to act upon, the Board of Directors; and the exercise of this power has been found inconvenient and objectionable to the Company. They therefore seek that the section should be repealed. The Company ask for power to raise additional capital not exceeding in the whole £60,000, and sanction is required to the borrowing of an additional sum not exceeding £4166 in respect of the capital authorized by the Act of 1874, and up to one-third of the issued additional capital. The standard dividend on the additional ordinary capital is to be 7 per cent., and 5 per cent. on the portion issued as preference. The standard price of gas is proposed at 4s. 3d. per 1000 cubic feet in the borough, and 4s. 6d. outside. The ordinary sliding-scale clauses are to be applied, operative half yearly. The prepayment clauses are also included. The illuminating power of the gas is suggested at 14 candles, tested under modern conditions. These changes necessitate the repeal of various sections in the Company's Act of 1874. The old 10 and 15 per cent. discounts clause appears in the Bill. Provision is made for insurance, renewal, and reserve funds. [*Parliamentary Agents: Messrs. R. W. Cooper and Sons.*]

The preamble of the Bill promoted by the Rhymney and Aber Valleys Gas and Water Company covers three pages. The history of the concern traced there is composed of the affairs of both the gas and water concerns; and we will therefore pass at once to the gas section of the Bill, leaving the water section for reference when dealing with the water measures of the session. Lands are scheduled for gas-works at Caerphilly and for the Pontlottyn and Hengoed gas-works; and, by agreement, it is desired to purchase not exceeding 5 acres of additional lands. The Company request to be allowed, in addition to the amount of preference capital authorized by the Act of 1905, to attach a preferential dividend not exceeding £6 per cent. per annum to a further part of the unissued ordinary capital authorized by the Act of 1898 to an amount not exceeding £50,000, by the issue of new preference shares; and also, notwithstanding the rate of interest prescribed by the Act of 1905, to issue a sum not exceeding £60,000 (part of the preference capital authorized by the Act of 1905), and attach thereto a preferential dividend also not exceeding 6 per cent. per annum. Embraced in the Bill are the prepayment clauses, one prescribing that the illuminating power of the gas shall not be less than 12 candles, and another providing for the use of the "Metropolitan" No. 2 test-burner. [*Parliamentary Agents: Messrs. W. & W. M. Bell.*]

"COAL."*

THE subject of coal is ever an interesting one to gas engineers; and it is with pleasure that we welcome a useful work upon this fascinating subject. "Coal," by James Tonge, belongs to the "Westminster" series; and although it does not attempt to deal with its title matter in an exhaustive manner, yet there is a great deal of useful information contained within its pages. Coal was not largely employed till the reign of Queen Elizabeth; but its use was attended by much prejudice. In 1662, a "hearth tax" on every fire-place or hearth was imposed by Charles II. And even nowadays one cannot but agree that there was some justification for its introduction; for anything that defiles the air we breathe should be discouraged as far as possible, and nothing is more objectionable than a smoke-ridden atmosphere. It was not, however, till the invention of the steam-engine in 1784 that the possession of rich coalfields enabled England to take full advantage of its immense natural resources.

The origin of coal and the mode of its formation are dealt with fairly comprehensively. The author traces the causes of the formation of seams, and explains that in the carboniferous period a tropical heat undoubtedly existed, and that by its aid the vegetation was remarkably prolific. It has also been satisfactorily proved that, long before the carboniferous age, the waters had covered the greater portion of the world's area; and this fact, coupled with the knowledge that in those early days upheavals of the earth's surface were not of infrequent occurrence, explains how a layer of luxuriant vegetation would be submerged and then be gradually covered by accumulations of sand and mud, to be eventually decomposed into coal. The author shows how the botany of the coal-measure plants and the discovery of fossils brings to light many important facts which would otherwise have been difficult to prove. A great many interesting illustrations are given showing in the plainest manner the original form of vegetable matter from which the coal was derived. The illustrations also in many cases show the various forms of foliage which may sometimes be discerned on its surface. A chapter on the coalfields of the British Isles gives many of the most important particulars and characteristics of the various fields, as does the subsequent chapter on foreign coalfields.

The author then passes on to the classification of coals, giving the composition and other particulars of the different varieties. The valuation of coal is next dealt with; and here the author enters into details as to the various points which should be fully considered before a choice is made. Foreign coals and their values come in for some attention; and the information here contained shows how fortunate is this country in the possession of high-quality coals. No other country contains so many of the superior varieties, although the United States runs a good second in this respect; while in the total output the latter country is far ahead of England even to the extent of 40 per cent.

In a chapter on the "Uses of Coal," figures are given to show the proportions employed for different purposes. Factories and domestic uses account for 24 and 21 per cent. respectively; but the former is used in its most comprehensive sense, for electrical works are not separately classified. Blast-furnaces with 11½ per cent., gas-works with 9½ per cent., and railways with 8 per cent., come next in order; while steel and iron works follow closely. From these figures it is quite evident that our domestic fires are chiefly responsible for the thick fogs that defile the atmosphere; for although factories are the larger consumers, yet, generally speaking, fuel is consumed to better advantage, and with less smoke, in boilers and furnaces than when used for our domestic hearths.

In the section devoted to "Gas," the composition of coal-gas is given; but it should be pointed out that the author erroneously states that this gas contains from 3 to 4 per cent. of carbonic acid, 3 to 5 per cent. of oxygen, and 7 to 8 per cent. of nitrogen. This is quite wrong, for coal gas, as supplied, contains very little, if any, more than 1 per cent. of carbonic acid, from 2 to 5 per cent. of nitrogen, and, with oxide purification now fairly universally adopted, no oxygen. The author would have it that coal gas is composed of 13 to 17 per cent. of inert gases; whereas 6 per cent. is an outside figure.

The next chapter, on the "Production of Heat from Coal," is a good one, and contains a description of the best-known fuel calorimeters, in which the principle on which they work is the same as in the gas-calorimeters. The method of calculating the calorific value of a fuel from its analysis is well explained.

The "Waste of Coal" is another matter briefly commented on by the author, who divides the subject into two parts—waste in working, and waste in consumption. Much of the former is due to considerations of safety in working the mines; but the latter is gradually being lessened—although this is not mentioned by the author—with every gas-engine that displaces a steam-engine, for it is a well-known fact that a gas-engine will develop fully two-and-a-half times more power from a given quantity of fuel than a steam-engine.

The "Preparation of Coal for the Market" deals with the customary method of handling the coal after it emerges from the shaft. The various appliances for screening, breaking, washing, and drying are clearly described. Many washers are capable of reducing the shale or dirt from 20 per cent. to 6 or 8 per cent.; while the cost, averaging little over 2d. per ton, increases the value of the coal by some 6d. or 7d. per ton. In this chapter, coke-ovens come in for some attention; a modern bye-product recovery system being well described in its main details. One sentence, in which the author is evidently referring to the manufacture of coal gas, runs as follows: "As a rule, a suitable coal should produce 9000 to 12,000 cubic feet of gas and 7 or 8 cwt. of coke per ton." The yield of coke here mentioned is distinctly below the average—9½ cwt. would be a more correct figure for modern working in all but small works. One point worthy of mention in the description of the coke-oven system is the fact that the waste heat from the flues of the ovens is used to raise steam in a range of boilers. The same arrangement could undoubtedly be adopted for utilizing the enormous waste heat in retort-houses. Briquette making is briefly mentioned; and a well-known machine is illustrated. It will be remembered that some particulars of the manufacture of briquettes from breeze and pitch were given in the "JOURNAL" some months ago.

After the final chapter on the "Coaling Stations of the World," the author concludes his book with a short and striking epiloque: "If he who makes two blades of grass grow where formerly one grew is a benefactor to mankind, surely he who gets 2 lbs. of coal where formerly only 1 lb. was obtainable, or who causes a fuel to yield double its former products or power, is no less a benefactor." Needless to point out, the fulfilment of this aspiration lies in the universal adoption of gaseous fuel.

* "Coal." By James Tonge, M.I.M.E., F.G.S., &c., Lecturer on Mining at Victoria University, Manchester. London: Archibald Constable and Co., Limited; 1907. [6s. net.]

EXPERIMENTS WITH SULPHATE OF AMMONIA AT THE DUBLIN EXHIBITION.

Report of the Sulphate Committee.

MANY of our readers may remember that during the period of the International Exhibition in Dublin last year the Sulphate of Ammonia Committee carried out a series of experiments to test the value of the commodity in which they are interested as compared with others for manurial purposes. They have just issued their report, which is as follows.

The plots were taken over on the 4th of February, when the preparation of the soil commenced. Samples of soil as taken from the plots were submitted for analysis to Mr. John Hunter, of Edinburgh, the Committee's Technical and Chemical Adviser, who prescribed the various mixtures of manures, which were kindly supplied by Messrs. Rough and Sons, of Broxburn, N.B. The Carnlough Lime Company (Co. Antrim) kindly furnished the ground caustic lime used in the experiments, which were carried out under the personal supervision of Mr. W. M. O'Friel, the Committee's representative at the Exhibition, who had the benefit of Mr. Hunter's advice throughout. The seeds and tubers sown on the plots were kindly supplied by Messrs. Sutton and Sons, of Reading, Messrs. Gartons, Limited, of Warrington, and a number of Dublin seedsmen.

Twelve plots of equal size—27 ft. by 9 ft.—were laid out. Six of these plots were treated with the manures stated below, and the remaining six in a similar manner, but with sulphate of ammonia omitted from the mixtures, for the purpose of comparison. It may be mentioned that both series had organic nitrogen, as the fermented bone meal applied to each contained nitrogen equal to over 5 per cent. of ammonia. The manures applied per acre were as follows :—

		Potatoes.	Mangels.	Swedes.	Oats.	Grass.	Barley.
Farmyard manure	tons	15	15	15	..	..	..
Superphosphate XXX	cwt.	2	2	2	2	2	2
Fermented bone meal	,,	2	2	2	2	2	2
Sulphate of potash	,,	1½	1½	1	1	1	1
Sulphate of ammonia	,,	1½	1½	1	1	1	1
Carbonate of magnesia	,,	¾	¾	..	..	..	..
Agricultural salt	,,	..	5	..	..	..	..
Ground caustic lime	,,	5	5	5	5	5	5

Ten days before sowing each crop, 5 cwt. of ground caustic lime was applied to the sulphate of ammonia plots and worked in.

Potatoes.—Eleven varieties were planted the last week in March, and included "Solanum Commersoni Violet" and "Blue Giant," which are supposed to be proof against blight. There is strong contention as to whether these are the same variety or not. The "Solanum Commersoni Wild" was also included, so that farmers could have an opportunity of inspecting the wild progenitor of edible potatoes.

It is interesting to note from the following table that sulphate of ammonia has increased the yield by 4½ tons, on an average, per statute acre :—

Name of Variety.	With Sulphate. Tons.	Without Sulphate. Tons.	Increase due to Sulphate. Tons.
Sutton's "Solanum Commersoni Violet"	12·15	9·00	3·15
Sutton's "Blue Giant"	11·25	8·55	2·70
,, "Epicure"	19·80	13·50	6·30
,, "Eastern Star"	13·95	9·45	4·50
,, "Million Maker"	15·30	11·70	3·60
Lord Rosebery's "Radium"	20·70	15·30	5·40
,, ,, "Acme" kidney	16 20	11·25	4·95
Thos. M'Kenzie and Sons' "Excelsior"	19·80	14·40	5·40
Sir James Mackay's "Northern Star"	15·75	12·15	3·60
M. Rowan and Co.'s "Eldorado"	19·35	13·50	5·85
Average of the ten varieties	16·425	11·880	4·545

In addition to the above manurial test, the following varieties were also grown for exhibition only. The yields of these are—

	Tons.
W. Tait and Son's seedlings	13 50
Hogg and Robertson's "Fusilier"	14·85
Alex. Dickson and Son's "Twentieth Century"	30·06
Robert Steel's "Old Champion"	16·20
,, "Brown Champion"	8·40
,, "Black Skerries"	10·80

There was no appearance of blight. They were sprayed twice; and, generally speaking, they were very fine crops.

Mangels.—Two varieties were shown, and although attacked by "Bean" fly and afterwards by several different varieties of caterpillar, they turned out a magnificent crop.

Sown April 20, 1907.	With Sulphate. Tons.	Without Sulphate. Tons.	Increase due to Sulphate. Tons.
Large yellow globe mangel	52·8	40·0	12·8
Intermediate red mangel	46·4	35·2	11·2

Swedes.—The two varieties produced sound, healthy, heavy crops, perfectly free from "finger and toe" owing to the application of ground lime. There was no appearance of "turnip fly" or "mildew."

Sown May 30, 1907.	With Sulphate. Tons.	Without Sulphate. Tons.	Increase due to Sulphate. Tons.
Superlative swede	40·96	31·36	9 60
Model swede	36·80	27·84	8·96

Oats.—The two varieties came up a fine healthy "braird" by the beginning of June (hard biting weather). They, however, began to fade and look rusty. Some of the roots were submitted to Professor Johnson, of the Royal College of Science, Dublin, who pronounced them to be attacked by a fungus which usually only attacks the new buds of cereals in cold, wet springs such as the last. He recommended spraying with 2 per cent. Bordeaux mixture, which was done without any beneficial effect. The ground was cleared and prepared for late turnips, which produced a fine crop as follows :—

Sown July 20, 1907.	With Sulphate. Tons.	Without Sulphate. Tons.	Increase due to Sulphate. Tons.
Mammoth purple top	25·60	19·20	6·40
Hardy white turnip	30·40	24·16	6·24

Perennialized Italian Rye Grass.—This was one of the most instructive and interesting crops grown. Half the plots, both with and without sulphate of ammonia, were cut and weighed; and the results worked out as follows :—

Sown April 2, 1907.	With Sulphate. Tons.	Without Sulphate. Tons.
Green	8·16	6·50
Hay	5·25	3·80

The North of Ireland and Ayrshire were deeply interested in this crop.

Barley.—Two varieties were sown, and produced an average crop; the year not being a favourable one.

Sown April 2, 1907.	With Sulphate. Bushels.	Without Sulphate. Bushels.	Increase due to Sulphate. Bushels.
Standwell	15	12	3
Ideal	14	12	2

Four plots of clover were grown, and through the application of 10 cwt. per acre of ground caustic lime, wonderful crops were obtained and attracted great attention, as they were grown on newly-made ground. The varieties were "Alsike," "Broad Leaved Red," "White," and "Perennialized Cowgrass." The plot of "Kohl Rabi" was very good, and was inspected by all classes of visitors. The small plots of parsnips and white and red carrots were excellent.

The marked difference of the plots grown with and without sulphate of ammonia was very great throughout all stages, and interested every class of visitor. Visitors came from all parts of the world—viz., Great Britain, every district in Ireland, France, Germany, Russia, Canada, United States, New Zealand, West Indies, Egypt, Japan, &c. More than 10,000 agricultural visitors passed through the plots. The great interest taken by the majority of the agricultural visitors, and their anxiety to obtain information, should have the effect of increasing the demand for sulphate of ammonia during the coming season.

A large quantity of the Committee's literature was distributed both at the stand and on the experimental plots; and, by special request made to our representative at the Exhibition, literature was forwarded to clergymen and school teachers in different parts of the Provinces, for distribution among farmers and school children. Appreciative notices of the plots appeared during the season in the chief agricultural papers and periodicals.

AUTOMATIC HOISTS FOR PURIFIER PLANTS.

IN our issue for Nov. 12 last (p. 484) we gave an illustrated description of an installation of overhead purifiers, designed by M. Payet, the Secretary of the Société Technique du Gaz. It may be remembered that his arrangement for the handling of purifying material consisted in automatically running skips on mono rails. One set of rails was placed underneath the purifier-boxes, and the other set was under the roofing of the upper stage of the house. A characteristic feature of the disposition adopted was the method by which the loaded skips were received and hoisted to the top floor by a lift, and, after being emptied, were returned by a second similar lift to the ground. Details of these automatic lifts or hoists were not given at the time in M. Payet's paper before the Society of French Civil Engineers, but have since been published. Some particulars concerning them may be of interest, especially to any engineers on the look-out for means of conveying purifying material to and fro.

It will be understood, from what has already been said, that the apparatus is in two distinct parts, each the complement and duplicate of the other. The first hoist receives the full skips, and elevates them on to the top rail; the second receives the empty skips, and lowers them to the bottom rail. Both hoists work absolutely automatically. Fig. 1 (p. 90) illustrates in plan and elevation a skip on its departure from the lower mono rail; while fig. 2 shows its arrival by the hoist at the upper mono rail. The hoist consists of a length of rail M, exactly corresponding to the mono rails on which the skips circulate. This length is suspended by four chains, in the form shown, from a cross horizontal rail T. Such an arrangement avoids oscillation while the skip is being raised, and at the same time it allows of the necessary inclination to be given to the mono rail hoist to correspond with the inclines of the fixed rails. The vertical lift is effected by chains as indicated in fig. 2, and two guide-runs in T iron ensure the steady and straight hoisting of the skip. The lifting chain passes over a return pulley, then round a grooved wheel fixed on to an

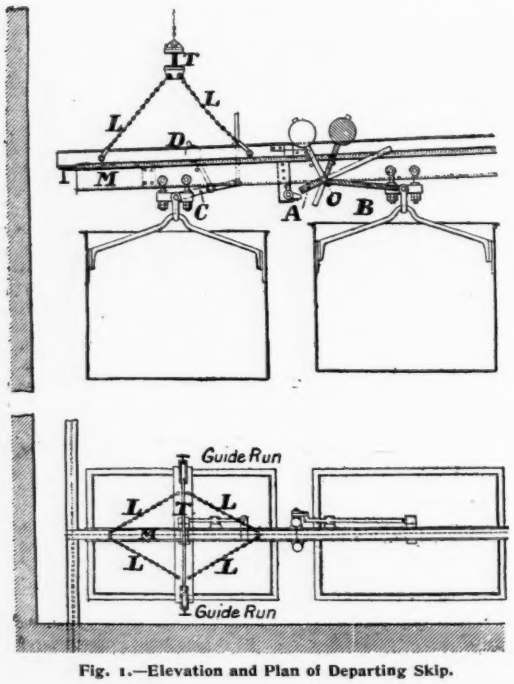


Fig. 1.—Elevation and Plan of Departing Skip.

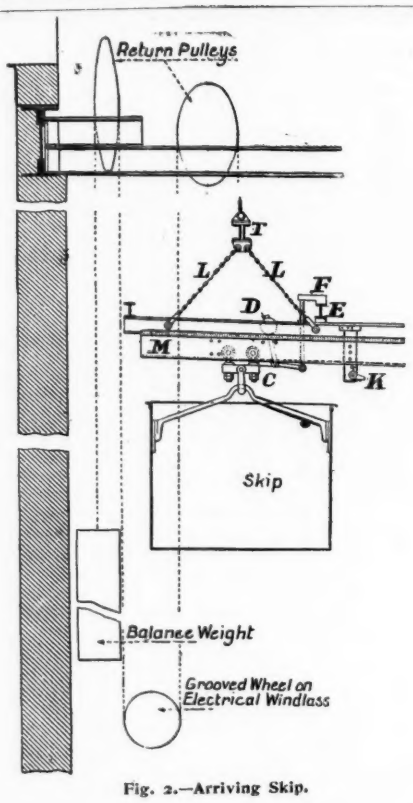


Fig. 2.—Arriving Skip.

electrical windlass, next over another return pulley, and ends with a balance-weight.

The safeguards that had to be taken were: (1) That only one skip could enter at once on the mono rail hoist, and only when the latter is in a line with the fixed rail; (2) that one skip being at the hoist, all the others are stopped before reaching it; (3) that the position of the skip arriving at the hoist be a fixed one; and (4) that the departure of a skip from the hoist be effected automatically. These *desiderata* were accomplished as follows: When a skip reaches the hoist, the tail A (fig. 1) of the lever moving on the axis O is thrown out so that the lever moves from its original position to that shown by the hatched lines. At the same time, and by the same movement, the arm B takes up the position indicated, in which it prevents the succeeding skip from passing into the hoist space. The arm B is specially designed to withstand the shocks of the skip-rollers. The skip which has run on to the hoist is stopped by a buffer, having come into position by throwing into gear (when passing) the lever C, which can fall back again owing to the weight D. The point of suspension of the skip is thus fixed with very little play. Then the lift works, the skip is raised and reaches its top position (fig. 2). There it knocks against a stop which gives the skip its required inclination to run on the mono rail. The skip, which on its upward course has been kept in position by the lever C, now throws this over by means of the regulating rod, which acts on the lever by coming in contact with the stop F fixed at E. This arrangement ensures that the automatic release of the skip can only take place when the hoist is in its proper position in line with the fixed rail.

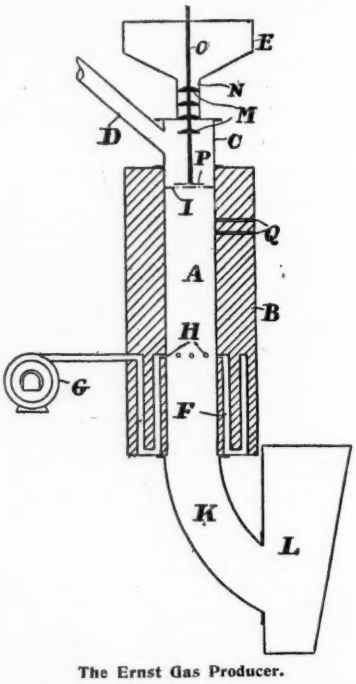
After the skip has started, the hoist automatically descends. At the same time that it reaches its lower position, a finger which it carries, K (fig. 2), which can move only from top to bottom, throws the arresting lever A (fig. 1) back to its original position, and thus allows another skip, if ready, to enter on to the hoist-rail. In this way the cycle of movements recommences. It will, of course, be understood that the second hoist at the other end of the purifier-house is precisely the same as the one described, and deals with the skips on their return from the top floor to the bottom.

It only remains to add that the French firm of MM. Samain et Cie. have worked out and made the detailed mechanisms of this automatic traveller and hoist.

THE ERNST PROCESS OF GAS MAKING.

Now that the general adoption of the incandescent system of gas lighting has rendered unnecessary the production of gas of high illuminating power, inventors have turned their attention to the construction of plant for producing gas of which the heating capacity is sufficient for making a mantle luminous. Among them is M. Emil Ernst, who has patented a process for the manufacture of gas from ordinary coal, or from a mixture of lean coal and oil, which he considers could be usefully employed for the lighting of villages or small towns. The French specification has lately been published, and the following particulars are from it.

If ordinary gas coal is employed as the raw material, its combustion is effected by the injection of air into a producer, which may consist of a vertical chamber into which coal is fed at the upper part, while from the lower part the coke is withdrawn through a hydraulic seal; the operation being such that the column of combustible material moves downward freely, either periodically or continuously, through the chamber. Combustion is carried to a point just sufficient to extract the gas from the coal and decompose the steam arising from the hydraulic seal; so that with a minimum quantity of producer gas (carbon monoxide and nitrogen) and a corresponding amount of coke, water gas is obtained on the one hand, and, on the other, the



The Ernst Gas Producer.

products of distillation—hydrogen, hydrocarbons, tar, &c.—from all the coal employed. This mixture of producer gas, water gas, and coal gas is conveyed away from the top of the apparatus and purified like ordinary coal gas. Compared with the usual method of manufacturing gas and coke in closed retorts and the employment of external heat, it is claimed for M. Ernst's process that it has the advantage of dispensing with expensive plant, and at the same time gives much better yields of coke. It is acknowledged that the gaseous mixture obtained has not the same

calorific power as pure coal gas; but it nevertheless has a sufficiently high temperature when burning to allow of its utilization with mantles for incandescent lighting.

The accompanying illustration represents an arrangement of plant for carrying out the process. It consists of a vertical combustion chamber A, surrounded by armoured masonry B, and provided at the upper part with a smaller chamber C made of sheet iron, and supporting the gas outlet-pipe D and the hopper E. At the lower part of the chamber a channel F is formed in the masonry for the purpose of heating the air. This channel is connected with a blower G, and has a series of openings H, through which the heated air passes into the combustion chamber at a suitable point below the normal filling level, which is indicated by the line I. At its lower extremity, the chamber is continued into a sloping channel K, which leads to a receptacle L, from which the quenched coke is removed by any suitable means. The feeder consists of several conical discs M, mounted on a rod O, passing through the hopper and the pipe N. When the rod has been raised sufficiently to bring the lower disc up to the level of the upper end of the pipe, the spaces between the discs can be filled with coal—thus becoming measuring compartments; and they are emptied by lowering the rod until the upper disc falls nearly to the level of the lower end of the pipe. A plate P, or some similar stop-piece, at the end of the rod, is checked in its descent to a certain degree by the quantity of coal then in the chamber; and this determines the number of compartments to be emptied. Consequently, though the rod is always raised to the same height, the distance it descends is variable; so that the feeding of the chamber goes on regularly.

In working, combustion begins at the lower part of the column of fuel, between the openings H and the sight-holes Q; and the steam arising from below is decomposed. The mixture of nitrogen, hydrogen, carbonic oxide, and carbonic acid then descends to the centre of the fuel, where the carbonic acid is reduced to carbonic oxide. In the upper portion of the fuel, therefore, there is nothing but nitrogen, hydrogen, and carbonic oxide—the result being that combustion cannot continue, and the temperature decreases. The incandescent zone ends at a point about level with the sight-holes. It is at this height that the final liberation of the gas from the coal occurs; and the process continues upwards, owing to the heat of the producer gas, water gas, and coal gas coming from below. Thus not only is combustion prevented, but likewise all prejudicial heating of the coal gas, which will consequently have the same properties as gas generated in ordinary retorts in the early stages of distillation. The coal gas, mixed with water gas and producer gas, formed within limits as narrow as possible, is conveyed from the cold part of the apparatus by the pipe D. When lean coal is employed, with oil, the process is the same as that described, only there is no production of coke.

OBITUARY.

It is with regret that we hear of the death at Rome, on the 2nd inst., of Mr. CHARLES WILLIAM JONES, the Engineer of the works of the Anglo-Romano Gas Company in that city. Mr. Jones was the son of the late Mr. John Hodgson Jones, and belonged to a family of gas engineers long connected with Continental gas undertakings. He had held his important position at Rome for about a dozen years, before which he had been the Engineer of L'Union des Gaz Company's works at Milan. Mr. C. W. Jones was elected a member of the Gas Institute in 1872, and was a member of the Institution of Gas Engineers. He had also been an associate member of the Institution of Civil Engineers for over thirty years—having been elected March 6, 1877. Two of his brothers are still connected with the gas industry—Mr. Walter Robert Jones, formerly of Rome, being now the Engineer of the Anglo-Portuguese Gas and Water Company's works at Figuiera da Foz, Portugal, and a younger brother being engaged in the chemical works of the Gaslight and Coke Company at Beckton.

Yorkshire Junior Gas Association.—A meeting of this Association will be held next Saturday in the Technical College, Bradford, when Mr. H. Butterfield will read a paper on "High-Pressure Lighting," and Mr. E. J. Sutcliffe one on "The Comparative Valuation of Gas Coals."

Manchester and District Junior Gas Association.—The next meeting of this Association will be held in the Manchester School of Technology on Saturday afternoon, when Mr. J. Alsop, of Stockport, will read a paper entitled: "How should Gas Profits be Disposed Of." The annual dinner and smoking concert are to be held in Manchester on Saturday, the 1st prox.

Scottish Junior Gas Association (Eastern District).—The quarterly meeting of the Eastern District Section of the Association will be held in the Heriot-Watt College, Edinburgh, next Saturday afternoon. The business will consist of the reading of a paper on "The Construction and Re-construction of Gas-Works," by Mr. A. Morton Fyffe, C.E., A.M.I.Mech.E., Assistant-Engineer of the Dundee Corporation Gas-Works; and the discussion of the following questions: "How best to search for supposed gas leakage," and "How can oxide of iron be used to the best advantage for gas purification?"

TESTING AMERICAN GAS FOR CANDLE POWER.

Views of American Gas Engineers.

In the "JOURNAL" for the 12th of November last (p. 486), we published some extracts from a report presented to the American Gas Institute, at the last annual meeting, by the Committee on "Methods of Taking Candle Power." The report was discussed in the afternoon of the second day of the meeting; and we now give some of the points raised.

Before the discussion opened, a letter was read from the Committee on "Nomenclature and Standards" of the Illuminating Engineering Society, calling the attention of the Institute to the fact that the Society had constituted a Committee, with Dr. A. C. Humphreys as Chairman, representing the various interests in America and other countries, to consider the question of establishing suitable, and, if possible, universal, nomenclature and standard for the science of illuminating engineering, and requesting the Institute to appoint a Committee to confer with the Sub-Committee of the above-named Committee on the subject. It was mentioned that a similar request was being submitted to the American Institute of Electrical Engineers; and the hope was expressed that through the co-operation of these two representative bodies, some definite action would be taken. A motion was made to refer the letter to the Technical Committee of the Institute; but, on the suggestion of the President (Mr. Walton Clark), the matter was deferred.

The first speaker was Mr. Morehead, who pointed out that a serious error, to which the Committee had not called attention in their report, was liable to occur in taking the readings of a photometer, owing to the difference between the eyes of the operator. In testing with a photometer, one side of the disc was looked at with one eye, and the opposite side with the other; and what was seen by each was balanced against the other. If a man had one eye for the standard and the other for the gas company, and the two eyes were not alike, he thought that it was well to know which way the good eye was looking. Where there were discrepancies between the reading of two men on the same gas for a long period, it would generally be found that there were differences in the eyes of one or other of the observers. There was another point by which, it seemed to him, the Committee were putting the Institute in a somewhat bad position, and that was their wholesale condemnation of the candle as a unit of light. He did not wish to be understood as being a champion of candles. He knew they were bad; and he had great trouble with them. But he questioned the advisability of putting on record that they were unreliable. Practically all the ordinances and specifications referred to the "English standard candle burning 120 grains of sperm per hour," as the standard of light. When the city inspector came to determine the candle power of the gas, he would not accept any standard except the candle. While they, as gas managers, knew that the pentane lamp was of 10-candle power, they could not make the inspector believe it. According to some figures of the value of the standard given by the Committee, an apparently 24-candle gas might be 25·86 or 21 candles, according to the value of the standard. Further, it was said that there was no official manufacturer of candles in the United States; that the industry was 60 years old; that there was not a national standard; and that there was no way of reproducing the standard. The Committee also stated that "out of 113 tests using the standard candle 80 per cent. were 1 per cent. off, and out of this average 5 per cent. of the candles were 19 per cent. off." It frequently happened that the inspector was anxious to find the gas of low candle-power, and thus make trouble for the gas company. When this was the case, what argument had they, when the inspector proposed to correct the candle power which he found, to compensate for some of the objections the Committee had set forth to the standard by which he ascertained the illuminating power? He could say: "It looks like a 24-candle gas; but the standard may be so much off that it is only 19 candles," and quote the action of the Institute as his authority for making the reduction. The candle as a standard was bad. They admitted and regretted it; but, as a matter of fact, being the only one they had, they must use it.

Mr. Morehead was followed by Mr. Bond, who said he was an advocate of the pentane lamp, which was certainly an improvement upon the candle as a standard. He had just come into possession of a record of candle determinations kept for a series of eight years. The member who had taken them had marked down in each case the quantity of sperm consumed in 600 seconds. It varied from 45 to 34 grains. Now, there seemed to be neither rhyme nor reason in any method suggested by which these variations could be explained until it occurred to him to tabulate them on the basis of the probable humidity in the air during the different seasons of the year. They immediately compiled the data for these eight years according to the months. They knew where the period of maximum and minimum humidity was in the course of the year, and by placing the data in this way they found that the average looked much better than it would in the individual cases in months where there was little humidity. The results bore out what was shown by the Committee. In their report there was a suggestion relative to some sort of psychrometer to take the measurement of the humidity in the air; and he would suggest that it might also give a very good indication of the vitiation of

the air in a room. If this instrument was operated outside, and they found the difference between the wet and the dry bulb, and did the same within the room, they would find the increase in the humidity; and this and the increase in the quantity of carbonic acid ran parallel. Therefore, one was as much a measure of vitiation as the other. This would tend to show whether a photometer room was in proper condition for taking the candle power at any time; and it made a comparatively cheap method of determining it. It seemed to him that the Institute should take action in the direction of the adoption of a proper burner by which the gas should be tested. If San Francisco should take its candle power with a flat-flame burner, and Boston, Baltimore, and New Orleans use an argand, the results would not be comparable.

A question having been asked with reference to the use of acetylene as a standard of illuminating power, Mr. Doherty replied that he was in a position to give some information on the matter. He said that several years ago he was interested in acetylene gas, and the variety of results obtained on the photometer and otherwise led him to believe that a more reliable standard was wanted. If they did not get pure acetylene gas, and if free hydrogen were present, they would not have a constant quality, and this caused error in the readings. Another objection he saw to acetylene gas for photometric uses was that it was difficult to burn. It was much more apt to be affected by the humidity of the atmosphere than ordinary gas; and if they operated a burner to the best efficiency in dry air, a slight change in humidity would affect the efficiency of the acetylene more quickly than it would the gas, which did not require so much air for its combustion. Mr. Klumpp said he thought the adoption of an acetylene burner as a standard would be a rather difficult matter. The combustion of acetylene required a burner that would give a more or less intimate mixture of air. This would be troublesome to control, and would greatly vary the intensity of the light. If, for instance, oxygen was added to acetylene, it would greatly increase the yield in candles per foot, due to a rise in the flame temperature, and produce a light too intense for direct comparison with illuminating gas.

Mr. Morris, referring to the point raised by Mr. Morehead in regard to the difference in eyes, said that for five or six years they made at his works a particular study of the inability of the ordinary assistant to read the photometer correctly from one side. They found repeatedly variations running up to as high as 10 per cent. where a man was using both eyes; and the result was that they issued instructions that if a man had to use two eyes he must read from both sides of the bar. They arranged all their tables in this way, so that the sight-box could be revolved; and they found, in looking over their records, that the variation was on an average more than 5 per cent. for the six or seven men who were reading. After they read on both sides of the bar, they came to the conclusion that the average variation with the men was less than one-half of 1 per cent.

At this point, the President called attention to the fact that Dr. Hyde, of the National Bureau of Standards, was present; and he asked him if he wished to speak on the subject.

Dr. Hyde expressed his appreciation of the courtesy extended to him. He said the Bureau were very deeply interested in all matters pertaining to standards for accurate measurements; and therefore he was very glad to have an opportunity of testifying to the magnificent work the Committee of the Institute had done in attempting to unify methods of gas photometry. After these introductory remarks, Dr. Hyde proceeded as follows: We are living in an age when systematization is of the most fundamental importance. The time is past when a manufacturer can go off into one little corner of the earth and read his candle power in any way he pleases. It would be unfortunate if a man in Milwaukee and a man in Boston were talking in terms of an entirely different thing. We want system, and we want uniformity; and there is nothing that will bring them about so quickly as just such work as your Committee have already done, and which I sincerely hope they will continue to do. I think it rather striking that, in the progress of the great movement towards systematization, particularly in regard to standards, photometry should be so far behind the other sciences. We have only one metre bar and only one standard kilogramme. Our electric units are closely defined throughout the world; but in the measurement of light the condition is entirely different. There is one unit in Germany, one in England, one in France, and unfortunately there are at least two in the United States. It is very desirable that only one unit should be used in the photometry of gas; and it seems to me equally desirable, and almost necessary, that the unit should be the same as that employed in the photometry of electric lamps, as otherwise complications will necessarily result. The Bureau of Standards, I always like to think, should take the place of the dictionary—it records existing conditions. It should not try to inject new standards or new units any more than it is the office of the dictionary to put new words into the vocabulary. But, as you can readily see, if there is no unanimity in regard to units, it is quite impossible for the Bureau to have a unit which shall be in general agreement with the unit used throughout the country. The first step, then, consists in determining upon a common national unit of candle power. Even if we have such a unit, however, we still have taken only a single step in the right direction. But we ought to have a common international unit. I sincerely hope the day will soon come when we shall have but one unit of candle power, and that if we say 10 candles or 20 candles we shall mean the same thing, whether we are talking of gas or electric light, or whether we are talking in England, France, or the United States. The difference between the units in use in gas and electricity, and the difficulties which have resulted, have been known for some time; but the matter has now come to a head. The Illuminating Engineering Society, which perhaps better than any other body in America represents the various lighting interests, has taken hold of this question through its International Committee on "Nomenclature and Standards," of which your honoured member, the newly-elected President of the Institute, is the Chairman. The action which the Committee have taken in regard to this question is shown by the letter which was presented to the convention this afternoon. I certainly hope that you will all of you consider very seriously the communication from the Illuminating Engineering Society. The Institute is the authoritative body of America in relation to gas matters; and if the Institute will give proper encouragement to this movement, it probably will not merely be national, but will become truly international in scope. The fortunate thing about our units of candle power is that, though we have an unfortunate difference, it is not very great, and could be done away with readily by compromise without any serious results to either the gas or the electric industry. But as our methods of photometry are becoming more accurate every day through such action as your Committee have taken in unifying and standardizing methods, and as there is just as much possibility that the units may drift apart as that they may come together, a compromise would in all probability be much more difficult of accomplishment ten years hence than now. How the two candles in use in America—both of which purport to be English parliamentary candles—came to be different, is a matter which time would not permit me to enter into, and into which I should hesitate to enter even though I had the time. The fact is that there are two units, and the further fact is that they are not so very different at present—about 4 per cent. or so. If the gas industry is willing to come up about 2 per cent. in its candles, and the electrical industry is willing to drop about 2 per cent., we shall meet on common ground. One other very fortunate element connected with this situation is that the intermediate value between the two units in use in America is very close to the average value of the unit candles used in England and France. Hence, as was stated in the formal request from the Illuminating Engineering Society, any compromise in the interest of national unity would at the same time be a compromise in the interest of international unity; and the time probably would soon come, if the movement had the unqualified support of such bodies as the Institute and the American Institute of Electrical Engineers, that we should have not only a common unit in the United States, but a common unit throughout the greater part, at least, of the civilized world.

The discussion was closed by Mr. Gartley, who had brought up the report. Referring to the source of error resulting from the difference in an observer's eyes, he said the Committee had dealt with this point in the portion of their report in which they recommended the "substitution" method in testing gas. Personally, he did not believe there was very much variation to be found in photometrical work as the result of difference in eyes. At the same time he thought Mr. Morris's suggestion, to have a bar graduated on both sides and a reversible disc, was an excellent and practical one. The sight-box should be, and was generally, so constructed that both eyes were used on each side of the disc. Mr. Morehead had objected to any disparagement by the Institute of the candle as a standard of light. Well, he (Mr. Gartley) thought they had all recognized for a number of years that this was the "sticking-point" in photometry. The Committee stated in their report that the candle did most of the work of standardizing in photometry, especially in America. In a great many instances, franchises, ordinances of Councils, and State laws required that the candle should be the standard by which or against which the value of the gas was judged in determining its illuminating value; and the Committee had tried to show that the matter was not without a definite solution—that progress could still be made in photometry if one would only take up the position that the candle was not a reliable standard. Until very recently, the matter was really in a bad way; but they had now presented to them a means of determining the unit of light and what was meant by "one-candle power." If the Committees of the various Societies interested agreed on what the unit was to be, the Bureau of Standards could always supply it; and there could be no objection on the part of any rational authority of a Municipality or a State to using or accepting it as a standard candle power.

During the reading and discussion of the report, a Referees' photometer was on view in the room; and at the close of his remarks Mr. Gartley called the attention of the members to it, and asked if anybody had a similar instrument in America. There was no reply.

The Coal-Conveying Plant at Hoboken (Antwerp) Gas-Works.—Messrs. Adolf Bleichert and Co. ask us to mention that in the particulars supplied by them of the coal-conveying plant they are erecting at the Hoboken (Antwerp) works of the Imperial Continental Gas Association, which were given in the "JOURNAL" for the 24th ult. (p. 903), they omitted to state that the originators of the scheme were Messrs. Corbet Woodall and Son, of Palace Chambers, Westminster.

DESSAU "VERTICALS" IN COMPARISON WITH OTHER SYSTEMS, MORE ESPECIALLY "SLOPERS."

By Ernest Körting, of Berlin.

At the Mariendorf Gas-Works, the new vertical furnaces with 84 retorts, equal to about 1,225,000 cubic feet per day, have been in action now for some time. Alongside of them "slopers" are at work; so that there is every facility for making a comparison of the two systems. Our experience with the verticals is, of course, too short to permit of results in every respect definite, but long enough to furnish data of considerable interest.

Before, however, going *in medias res*, it may be useful to make a few general remarks on the modern development of carbonization, for which the Berlin station is a very good object-lesson, as we have there, on different works, old fire-bar furnaces with hand labour, horizontal generator settings with hydraulic stoking machinery, "slopers," and verticals—all being in action at the same time, using about the same mixture of coals, and being kept under the same control.

Years ago, when labour was cheap and rich gas for the batswing and argand burners a necessity, the low-heat hand-worked fire-bar furnace and a production of (say) 9500 cubic feet per ton was the rule. The coal formed a more or less thin layer on the bottom of the retort, so that the rake could be passed over it. In the free space above the coal, the gas became superheated, and part of the hydrocarbons were split up, forming naphthalene, pitch, and even a little free carbon; collateral disadvantages being the necessity of scurfing and augering and the loss in ammonia. But as the heats were low, none of these drawbacks were of a serious nature. Things remained stationary for a long time, but at last, through the rising rates of wages and labour disputes, the impetus was given for the invention of stoking machinery and slopers.

Afterwards, the gradually rising price of raw material brought forth the desire to augment the production per ton of coal, which, however, was not attainable without a reduction in heating value and illuminating power, and in consequence only possible after the adoption of the Welsbach burner. The general means of securing a large production per ton are high heats and thin layers of coal. With Berlin coals and horizontal generator settings, we attain by this method as much as 32 cubic metres (11,500 cubic feet) and more.

In the meantime, the collateral troubles—viz., the formation of naphthalene and pitch, the scurfing, and the augering, and the diminution and deterioration of ammonia and tar—become strongly accentuated. In quite a different position are the slopers. As labour-saving appliances they have the advantage over the horizontals that the coal enters at one end and the coke leaves at the other; that, in consequence no room need be left for the rake; and nearly the whole section of the retort may be filled with coal. It is obvious that for slopers thin layers of coal would mean a great deal of additional labour, not to mention the fact that it is ever so much more difficult to make a small charge as even and uniform as a big one, so that heavy charging has to be adhered to, but the high make per ton abandoned. The other way—very high heats, considerably higher than those necessary for the thin layers in the horizontals—which would lead to a large production of gas, is not practicable because of the rapid destruction of the setting.

As a compensation, the collateral drawbacks of high heats are much mitigated in the case of slopers. I do not know from my own experience, but I dare say that horizontal through retorts with De Brouwer charging and pushing machines, which allow of heavy charges, especially when the gas exit is on one end only, must give similar carbonizing results to the slopers.

If, now, the heating value of the gas from slopers (or through retorts) is found unnecessarily high, and the production per ton too low, we have a simple method of correction. We send blue water gas either into the retort (auto-carburation) or into the hydraulic. Having the above in mind, it may be said with some justification that the slopers can be regarded as the intermediary step or the connecting-link between horizontal and vertical retorts; for in the latter the empty space above the coal, the diminution of which we have noted with the slopers, has entirely disappeared, as the retort is charged to the full capacity. The gas is in consequence even richer than that made in slopers, and ought theoretically to be less in volume as well. But this is certainly not the case; on the contrary, the output of gas per ton seems to be higher.

The explanation of this phenomenon is obvious. It requires a good deal of skill, with coals of ever-changing quality, to fill an inclined retort with a perfectly uniform charge. As soon, however, as there is too much on one spot, it will not be properly carbonized within a given time, causing a more or less serious deficit of gas. This will be still more the case if the retort should not be properly heated from top to bottom, or if the coal in question should be a creeper. The more frequent charging and discharging (every six against every twelve hours) may also be made responsible for part of the loss. It may also be assumed that in the verticals some of the aqueous vapours formed by the distillation of coal will be converted into water gas, and so add to the output. The phenomena which I have called collateral drawbacks of high heats have disappeared with the verticals. There is scarcely any formation of pitch and no naphthalene. The quality of the tar is much improved, and there is more of it into the bargain.

We also have more ammonia in the gas, while the amount of bisulphide of carbon is reduced by more than 50 per cent. The coke is harder and contains less breeze; and last, but not least, if a thin jet of steam is sent into the retort, water gas will be produced, the quantity of which can be varied according to requirements. We are now in Berlin in the favourable position that we have on one works horizontals only, on another slopers, and on a third (Oberspree) verticals. If, therefore, the carbonizing results of these works are carefully controlled, as is certainly the case in Berlin, we shall be able, with some accuracy, to determine the economical consequences of the four different methods of carbonization.

Table I.—*Economical Consequences of the Four Different Methods of Carbonization.*

—	Horizontals.		Slopers.	Verticals.
	Fire-bar.	Generators.		
Coal gas produced per ton of coal	305 c.m.	320 c.m.	305 c.m.	say 320 c.m.
Water gas produced per ton of coal	34 c.m.	19 c.m.	42 c.m.	,, 40 c.m.
Mixed gas of 5,220 calories 585 B.Th.U. at 0°C and 760 mm.	339 c.m.	339 c.m.	347 c.m.	,, 360 c.m.
Coke produced, per cent. on coal carbonized, lumps above 9/16 inch	66 %	63·5 %	63·5 %	,, 68·5 %
Breeze produced, per cent. on coal carbonized	4 %	6·5 %	6·5 %	,, 1·5 %
Total coke produced, do.	70 %	70 %	70·0 %	,, 70 %
Tar produced	4·5 %	4·5 %	4·5 %	,, 5 %
Ammonia produced	2·5 kilos.	2·4 kilos.	2·65 kilos.	,, 3·2 kilos.
Coke fuel for retort furnaces, per cent. on coal carbonized	24 %	14 %	12 %	,, 14 %
Coke fuel in boiler furnaces: Exhausters, &c.	2 %	2 %	2 %	,, 2 %
Coke fuel in boiler furnaces: Steam for water gas	—	—	—	,, 1 %
Coke fuel in boiler furnaces: Power	—	3 %	—	—

Assumed Value of Coal and Bye-Products.

1 ton of coal	20s. 0d.	
1 ,, coke	18s. 0d.	
1 ,, coke from verticals	18s. 6d.	
1 ,, breeze	6s. 0d.	
1 ,, coke and breeze for boilers	10s. 0d.	
1 ,, tar from slopers	20s. 0d.	actual relations
1 ,, ,, verticals	25s. 0d.	actual relations
1 kilo. of ammonia	50 pfg. = 6d.	
1 stoker's wages per shift	5s. 6d.	

A few explanatory remarks on the above table may be permitted. In order to make the production of (coal and water) gas in verticals comparable with that produced in horizontals and slopers, the quantities of water gas are added which would bring about equal heating values throughout, though in a medium-sized gas-works one would never think of erecting a water-gas plant merely for the purpose of producing as little as 6 per cent. on the coal gas thereby. Such a small quantity of blue gas would very likely cost as much as coal gas. The coke figures show the superiority of the hard coke in verticals, whereas the fuel account for retort furnaces proves that the carbonizing in thin layers requires more fuel than the heavy charges (Coze). The boiler fuel comprises all requirements with the exception of coal and coke handling. It is especially high in the case of hydraulic stokers, which need considerable power. The fuel used for verticals is responsible also for the water gas produced therein.

The coke from verticals is, at the present moment, sold at a price which is only 6d. higher per ton than that of ordinary coke. I daresay it will fetch a better price in time. For broken coke, there is no large market in Berlin; it fetches barely the same price as the large sort. As, in consequence, hardly any coke crushing is done, the different amounts of breeze are due to the different methods of handling or the quality of the coke (influence of carbonization). In the case of both verticals and slopers, the coke passes along the hot-coke conveyor into a small hopper, from thence into trucks which are lifted and emptied into the large hoppers, which again discharge their contents over rocking sieves into railway trucks. The small stuff falling through the sieves is divided into small coke and breeze (less than 9·16ths inch, or 15 mm. in diameter). The figures for the verticals were found by a 12 days' exact test.

It will be remembered that each vertical retort, before receiving its charge of coal, must take a small quantity of breeze, filling up the bottom mouthpieces which are too cold for carbonization. The aggregate quantity of breeze used for this purpose is a considerable one, and was, as a matter of course, carefully measured during the trial. It might be expected that all this additional

TABLE II.—*Comparative Statement of the Cost Price of Gas (5220 Calories at 0°C. and 760 mm. or 585 B.Th.U. at 32° Fahr. and 30" Bar.), Delivered into Holders.*

—	HORIZONTALS.						SLOPERS.			VERTICALS.		
	Firebars.			Generators with Hydraulic Stokers.								
		Per 1000 C. Ft.	Per 100 C. M.		Per 1000 C. Ft.	Per 100 C. M.		Per 1000 C. Ft.	Per 100 C.M.		Per 1000 C. Ft.	Per 100 C.M.
		s. d.	M.		s. d.	M.		s. d.	M.		s. d.	M.
Coal carbonized at 20 M. per 1000 kilos.	305 c.m.	1 10¼	6·55	320 c.m.	1 9½	6·25	305 c.m.	1 10¼	6·55	320 c.m.	1 6¾	5·55
Coke fuel (retorts) at 18 M. per 1000 kilos.	24 p. ct.	0 5	1·41	14 p. ct.	0 2½	—·78	12 p. ct.	0 2½	—·71	14 p. ct.	0 2½	—·70
Boiler fuel at 10 M. per 1000 kilos.		0 0¾	— ·06		0 0½	—·16		0 0½	—·06		0 0½	—·08
Purifying materials and wages. Net cost		..	..		..	..		..	..		..	..
Wages: Manipulation—												
Retort-house—												
Foremen			— ·03			—·03			—·03			—·03
Stokers			..			—·26			—·24			—·08
Clinkerers			1·05			—·03			—·03			—·03
Scurfers		0 3½	..		0 1½	— 02	0 1		—·02	0 0½		—·01
Engine drivers, &c.			— ·01			—·05			—·01			—·01
Boilers—						.40			.34			.17
Firemen			— ·01			—·01			—·01			—·01
GROSS COST.		*2 7*	*9·07*		*2 1¾*	*7·59*		*2 2*	*7·66*		1 10	*6·50*
Coke produced at 18 M. 18·50 verticals	66 p. ct.	1 1¼	3·89	63·5 p. ct.	1 0	3·57	63·5 p. ct.	1 0¾	3·75	68·5 p. ct.	1 0	3·52
Breeze produced at 6 M.	4 p. ct.	0 0¼	— ·08	6·5 p. ct.	0 0½	—·12	6·5 p. ct.	0 0½	—·13	1·5 p. ct.	..	—·02
Ammonia (NH_3) at 0·50 M. per kilo.	2·50 kil.	0 1½	— ·41	2·40 kil.	0 1	—·38	2·65 kil.	0 1½	—·43	3·20 kil.	0 1½	—·44
Tar at 2 M. per 1000 kilos. (Vertical tar, 2·50)	4·5 p. ct.	0 1	— ·29	4·5 p. ct.	0 1	—·28	4·5 p. ct.	0 1	—·29	5 p. ct.	0 1¼	—·35
VALUE OF PRODUCTS.		*1 4*	*4·67*		*1 2¾*	*4·35*		*1 3¼*	*4 90*		*1 2¾*	*4·33*
Net cost of coal gas	305 c.m.	1 3	4·40	320 c.m.	0 11	3·24	305 c.m.	0 10½	3·06	320 c.m.	0 7¼	2·17
Water gas, including wear and tear	34 (11 p. ct.)	0 6	1·72	19 (6 p.c.)	0 6	1·72	42 (14 p. ct.)	0 6	1·72	40 (13 p. ct.)	..	..
NET COST OF MIXED GAS.	*339* c.m.	*1 2*	*4·12*	*339* c.m.	*0 10½*	*3·16*	*347* c.m.	*0 10*	*2·89*	*360* c.m.	*0 7¼*	*2·17*
Wear and tear—												
Retort beds		0 0¾	— ·22		0 0¾	—·23		0 0½	—·15		0 ½	— 08 say
Stokers and sundry tools.		0 0¾	— ·14		0 0¾	—·15		0 0¾	—·10			—·06 ,,
		1 3¼	*4·48*		*0 11¾*	*3·54*		*0 10¼*	*3·14*		*0 7¾*	*2·31*

breeze would be got back, and a fair amount of fresh breeze, due to the handling, into the bargain. But in reality there is only a very small amount of breeze recovered, over and above the quantities taken into the house. The question arises, therefore, what has become of this breeze, especially as not much of it is seen when the retort is discharged. The most probable explanation is this: The breeze in the first stage of carbonization gets soaked with tar; it is also partly mixed with coal, and afterwards heated together with the same, being kept the whole time under considerable pressure. In other words, all the conditions are there for making patent fuel (briquettes) out of a large portion of our breeze, which in consequence is recovered in good-sized lumps, resembling ordinary coke in every respect.

On the basis of the figures given in Table I., it is possible to calculate the cost of gas into the holder for the different systems. The labour and wear and tear results, which will be afterwards dealt with in detail, may be anticipated.

The comparison made in Table II. is, as a matter of course, imperfect. Local conditions, preconceived ideas, and prejudices will always have a certain influence even on an engineer who tries his very best to be impartial. Some of the figures are even mere guesswork (as, for instance, the wear and tear of the verticals), but have been admitted after all, as otherwise the object —viz., to show what can reasonably be expected from the verticals in comparison with slopers—would not have been attained. A correction of my figures will have to take place when the experience of years has been accumulated and critically sifted.

Assuming now that our results are fairly accurate, the reader has the opportunity of seeing at one glance what our industry owes to the different improvements, beginning with the introduction of the generator furnace towards 1880, the hydraulic stokers (say 1890), the Coze furnace in 1895, and the verticals in 1907. [The machine-worked through retorts are not included in this list; but I presume they will rank about on a level with the Coze.]

Economy due—	(Under present Berlin conditions.) Per 100 Cubic Metres.	Per 1000 Cubic Feet.
To the generator furnace	say 0·94 mark	3¼d.
,, ,, hydraulic stoker		
,, ,, Coze furnace over the hydraulic stokers	,, 0·40 ,,	1½
,, ,, vertical furnace over the Coze furnace	,, 0 83 ,,	3
Total	2·17 mark.	7¾d.

This is certainly progress. But the whole profit derived from so much strenuous and ingenious work is only equal to 17 per cent. on the selling price of our gas. Since 1890, however, the prices of coal and labour have risen enormously—so much in fact, that all our economies are not sufficient to compensate us. We have, therefore, to own to the discouraging fact that we scarcely can, at the present moment, produce our gas at the same price as our fathers did with firebar furnaces and manual labour. In the meantime, the investments in high-class plant have become very heavy, while reduced gas prices, higher subsidies to municipalities, and a fierce competition with the electric light have made heavy inroads into our resources.

LABOUR.

Nine Coze furnaces form a battery which is worked in Mariendorf by one gang of men, and has almost exactly the same length as seven verticals, which, moreover, produce very nearly the same quantity of coal gas, *plus* water gas—viz., 35,000 cubic metres (1,236,000 cubic feet) per 24 hours. These two units are therefore to be taken as the basis of comparison for both the cost of erection and the working results. There are for the nine slopers, nine stokers in 24 hours, three for each eight-hour shift; whereas for the seven verticals only four men are required, who work in the following manner:—

Two men	8 hours
Interval without work	4 ,,
Two men	8 ,,
Interval without work	4 ,,
Total	24 hours

The following table will give an idea of the amount of real work done in each case:—

TABLE III.—*Comparison between the Labour which, on the Average of Seven Days, was necessary for Working Nine Coze (81 Retorts) and Seven Vertical (84 Retorts) Furnaces; the Standard being Men-Hours (One Man Working One Hour).*

	Coze Furnaces. Men-Hours per Day.	Vertical Furnaces. Men-Hours per Day.
Augering	13·2	0·5
Discharging retorts	7·2	3·3
Charging retorts	12·0	3·9
Filling generators	3·6	2·3
Sweeping, cleaning, steaming verticals, &c., sundries	2·4	4·3
	38·4	14·3
Daily production of coal gas (say)	30,000	—
,, ,, of mixed gas (say)	—	35,000
Per 1000 cubic metres of gas	1·28	0·41

It will be seen that the economy in labour is equal to about 68 per cent. One of the most disagreeable items of retort-house

work—viz., the augering—has disappeared altogether. It would seem that copious steaming has a beneficial effect in this respect. At any rate, in Mariendorf we need not pass the auger through the ascension-pipe (whatever the coal) more than once a week.

Greatly reduced is also the charging of retorts and the filling of generators, and not only in point of time. The men are not nearly so much exposed to heat, either. The discharging of the retorts takes less than half the time, and might be effected much more quickly still if the capacity of the coke conveyor were to be augmented. It consists of merely opening and closing lids, as against the continuous "pricking" from below and pushing from above in the case of the slopers. In other words, the work has become much easier all round. The four men in 24 hours' working seven vertical furnaces have not nearly so much work as the nine men in 24 hours' working nine slopers; and there are also some structural improvements under consideration which promise a further reduction of labour. I dare say that a production of 80,00 cubic metres of gas (2,825,000 cubic feet) with four stokers is within the reach of possibility. This figure means that the labour question on a gas-works has been finally settled in favour of the employer.

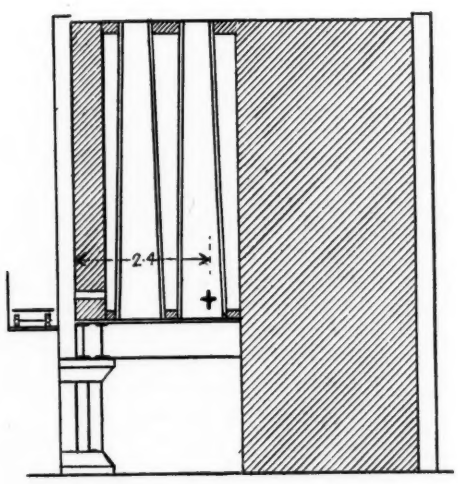
The retort-house labour of a stoker comprises in both cases augering, charging and discharging retorts, and feeding the generators; the clinkering of the fires being done by special men.

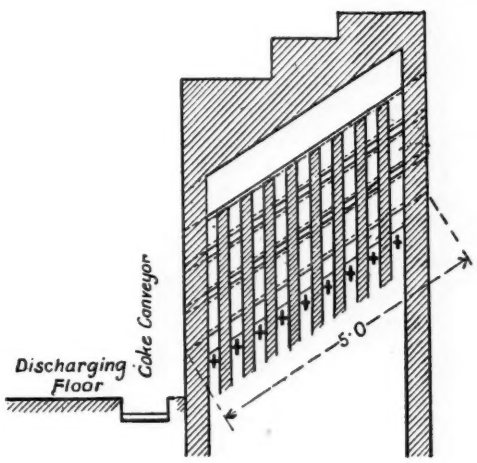
Supervision.

The vertical furnace, being worked at its extreme lower end at rather high heats, certainly requires conscientious supervision; and I am afraid that in a great many existing gas-works engineers and foremen do not take very much trouble in this respect. The representative of a firm of contractors told me once that if they erect a furnace and bring it into action, the dampers for draught and primary and secondary air being properly adjusted for the then prevailing conditions, temperature, &c., they are frequently called back to that furnace after a year or two, because the results have become less satisfactory. And what do they find? All the dampers have become immovable through rust, &c., because they have never even been touched in the interval.

Now it has always been a tradition with the Imperial Continental Gas Association that nothing pays better than a minute control of the furnace; and I have myself, when a young engineer in Vienna, taken the trouble to instruct a number of young and intelligent workmen in the art of treating generator furnaces. The result was very satisfactory; all of them being now head retort-house foremen of our Berlin works. Their reliability is beyond any doubt, and the interest they take in their work, which they have thoroughly mastered, is something marvellous. I know, therefore, from experience, that good control is easily to be procured, if the chief engineer is determined to have it. It is quite another chapter whether the construction of the furnace permits of efficient control and regulation. If, for instance, we look at the section of a Coze furnace, we see a number of vertical division walls, and between them at + the points where the combustion takes place. It is obviously impossible to see the different flames, to say nothing of measuring their temperatures.

But even if the construction of the furnace would allow of leaving holes in the partition walls, it would not be possible to get at them with rods, &c., because there is no room for doing so at the lower end of the furnace; whereas at the top, the heat streaming forth would not permit of any handling. In Coze furnaces,





therefore, we are only able to see that something is amiss when the retort from the inside shows a white spot; and then it is often already too late.

In the case of the verticals, the point of ignition + is easily accessible to the eye as well, as the regulating tool. The engineer or foreman, lying on a little carriage, which he moves with his foot, can inspect one combustion chamber after the other. Wherever a bright spot is noticed, the pyrometer will be applied and give an absolutely correct indication of the temperature. The remedy is equally simple and carried out within a few minutes. In other words, the Bueb vertical setting is the first furnace in the history of the gas industry permitting an absolutely arbitrary distribution of heat. I like to compare it with a good horse, obeying the slightest touch of its rider.

Wear and Tear.

The wear and tear is, as every gas engineer knows, an important factor in the cost of retort-house work. I beg to add a table showing the wear and tear figures for the different Berlin carbonizing plants; the amounts being an average for the past five years.

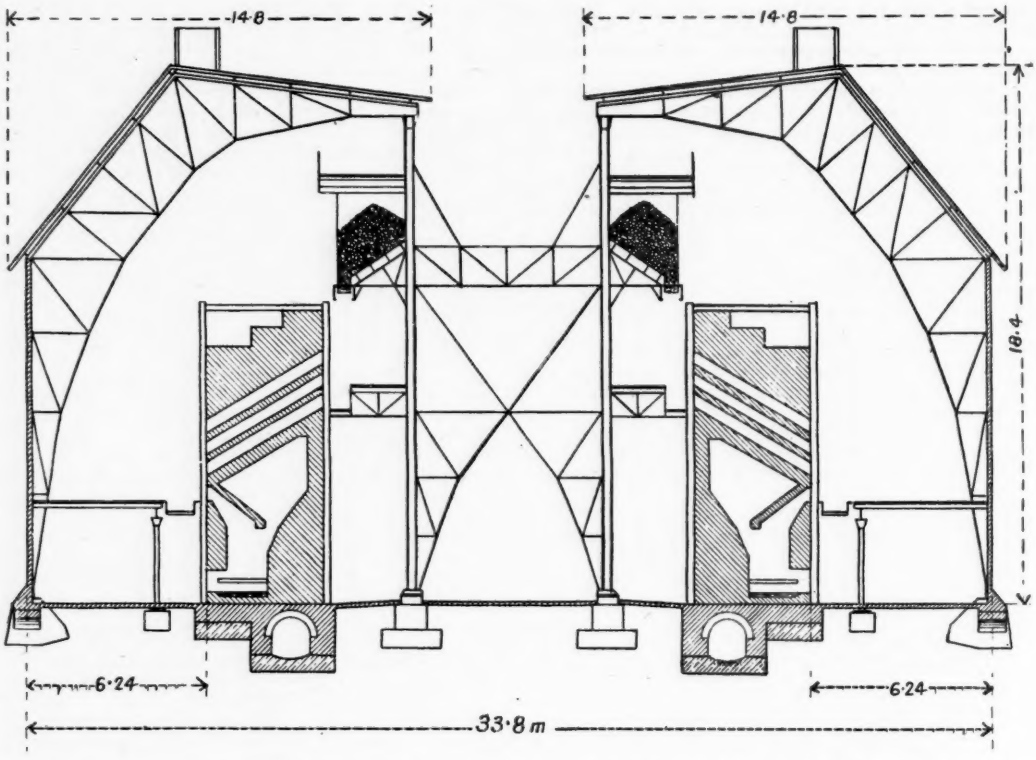
Table IV.—*Amount Spent on Wear and Tear per* 100 *Cubic Metres of Gas Produced.*

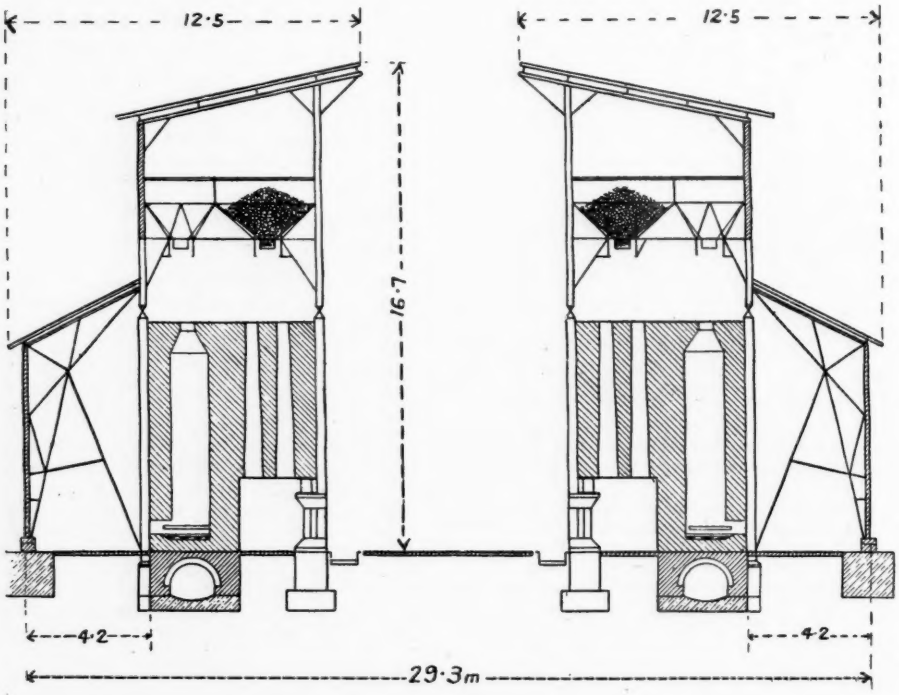
—	Retort Beds.	Stokers' Tools, &c.	Hydraulic Stokers.	Mechanical Coke Conveyor.	Narrow Gauge Trucks or Wheelbarrows.	Total.
	Pf.	Pf.	Pf.	Pf.	Pf.	Pf.
Firebar furnaces . .	21·9	11·9	..	..	2·3	36·1
Horizontal generators with hydraulic stoking	22 8	9·2	3·5	..	2·6	38·1
Coze furnaces . . .	15·4	7·9	..	3·0	..	26·3
Vertical ,, . (say)	8·0	4·0	..	2·0	..	14·0

It is interesting to note that the inclined retort-beds have caused 50 per cent. less wear and tear than both horizontal firebars and generator furnaces. With the larger capacity of the furnace, the repairs have diminished. It is not known yet, but only reasonable to expect, that the Coze furnaces will also in this respect form the connecting-link between horizontals and verticals. For if, in a vertical furnace, less than a quarter of every retort gets exposed to the full heat—this being the extreme lower end into the bargain, which is easy to repair—it may certainly be hoped that the wear and tear will be considerably reduced. It is the same with the stokers' tools and the hot-coke conveyor. The very action of stoking has been done away with, and scarcely any stokers' tools will be required in future. The amount of repairs necessary for the hot-coke conveyor will depend to a large extent on the time it is in action. For instance, in the case of the hydraulic stokers, there is all the work for a large number of furnaces concentrated in one pair of machines, which in consequence must be kept going nearly the whole day long. The wear and tear of the hot-coke conveyor, which must follow suit, will therefore be considerable. [Assumption of the author, who has no experience in this respect.] The Coze furnaces are discharged at a much quicker rate.

With them the conveyor need only be in action for 11·5 hours out of the 24, whereas the verticals do not require it more than even 3·5 hours; so that they may claim a very considerable reduction of repairs. Altogether, it is very instructive that the larger unit and the much greater simplicity of design and working conditions have so far placed the Berlin Coze furnace in a far better position, in regard to wear and tear, than the horizontal with hydraulic stokers. The verticals are, it may be assumed, another long stride in the same direction. The unit has become much larger still, and so has the simplicity of plant and work. I feel, therefore, entitled to claim for them a similar reduction of repairs.

It may, it is true, be said against this opinion that the bottom mouthpieces of the verticals, which are manipulated by means of





cranks, handles, and some shafting, are of a less simple description than those of the Coze furnaces. But the shaft for each retort is only in motion for a few seconds every day. If that is bad, what will the defenders of continuous carbonization say, who have to keep the coal feeder and coke discharger at work without interruption? Furthermore, the motion of the lids has become very regular and smooth by the mechanical handling. The gas-tight surface of the mouthpiece is never polluted with thick tar, nor are heavy iron rods being continually passed in and out, as is the case with the Coze furnaces, the retort mouthpieces of which are very roughly handled by the hot and excited stokers. Probably, therefore, the great simplicity, smoothness, and cleanliness of the work will cause a diminution of wear and tear also in this case of apparent greater complication.

In this connection, perhaps a remark may be permitted of a more general character. It might be thought *à priori* that a modern gas-works, with all its labour-saving machinery, would cause an altogether larger outlay on wear and tear than an old-fashioned one. Berlin experience teaches the contrary. For the upkeep of plant we have paid in Berlin, between 1900 and 1904, 20 per cent. less per 100 cubic metres than between 1890 and 1894; but for wear and tear of mains a great deal more. In other words, charges on the production of gas have gone down, whereas those on mains, service-pipes, &c., which mean expansion of business, show a large increase.

Retort-House and Cost of Installation.

It will be remembered that nine Coze furnaces, with the addition of some water-gas, are equal to seven verticals, and that the length of the two different benches is nearly exactly the same. The section through the two retort-houses, which have both given much satisfaction in their way, will therefore be sufficient for forming an opinion on their merits and drawbacks. The Coze furnace requires its coal alongside the top of the furnaces and the charging-floor below the coal-hoppers. In consequence, a rather heavy substructure has to be provided for both purposes. Below the bottom end of the retorts we have the generators, which have to be attended to independently of the carbonizing work. A special discharging-floor is therefore indispensable, and must support the hot-coke conveyor also. As the steam rising from this has to go right up, the ridge of the roof must be above the lower end of the furnace—thus making the total height rather considerable.

It will be perceived at the first glance that by putting the retort upright the whole construction is much simplified. The coal being kept above the furnace, a very light support is sufficient,

and no special charging-floor is required. The coke falls directly into the conveyor; thus making a discharging-floor superfluous. Roofing is of the very lightest description, and the ventilation is perfect.

I add a comparative statement of cost for both houses, from which it will be seen that the verticals are more advantageous also with regard to the cost of installation.

TABLE V.—*Comparison of Cost between Nine Coze Furnaces with Retorts 4·80 Metres long (15 ft. 9 in.) and Seven Vertical Furnaces with Retorts 5 Metres long (16 ft.), both Inclusive of Retort-House.*

	Coze. Marks.	Verticals. Marks.
Iron construction without gable ends and coal-bunkers (Coze 108,902 kilos. and verticals 48,010 kilos., at 30 marks per 100 kilos).	32,672	14,403
Coal-bunkers, at 38 marks per 100 kilos.	12,177	7,400
Discharging-floor, including wrought-iron floor-plates	6,170	—
Nine Coze or seven vertical furnaces, including mountings, &c.	183,347	221,500
Furnace foundations and chimney-flues	7,900	7,000
Foundations of retort-house	2,400	3,900
Chimney	6,100	6,100
Bricking-in side walls and floor	4,760	4,400
Roofing	5,450	3,900
De Brouwer trough	13,500	13,500
	274,476	282,103
Proportionate share of water-gas plant	30,000	—
" " naphthalene washer	16,000	—
	320,476	282,103
	(£16,024)	(£14,105)

Five or Four Metre Retorts.

It is certain that the fifth metre of additional length is, to a slight extent, detrimental to the illuminating power. One would in consequence choose the 4-metre retort wherever high illuminating power is of importance. As soon as this is not the case—in nearly all corporation works in Germany, for instance—I do not see any reason why one should not make use of the larger capacity granted by the 5-metre retort. In comparing the results attained in different places with 4 and 5 metre retorts, one has to bear in mind that illuminating power production per ton and production per retort cannot reach their maximum at the same time. For instance, when high illuminating power is desired, one has to discharge the retort as soon as carbonization is completed, or scarcely completed—say after ten hours—and to refrain from steaming too much. If, on the contrary, one requires a high production per ton, a good deal of steaming is necessary, which, however, is useless without a certain temperature being kept up. One is, therefore, in this case compelled to leave in the charge somewhat longer than is necessary for complete carbonization (12 hours). For the 4-metre retort, under normal conditions, one may therefore claim a comparatively high amount of coal carbonized, coke produced, and gas produced per retort; whereas the 5-metre retort will excel in output per ton and reduction of labour. With regard to the latter item, it is not only convenient to charge regularly every twelve hours, but, by the copious steaming, the heats are so reduced that little or no augering is necessary.

Leaving the illuminating power out of the question, the working methods described as being natural for the two different lengths of retorts may be with profit changed whenever the market conditions require it. When coke is scarce and fetches a high price, one will naturally produce as much of it as possible; while dear coal will induce us to maintain a large output per ton. I add some average figures for both types of retorts—Table VI.

Continuous Carbonization.

The results of the Woodall-Duckham oven so far published do not seem to be very complete and final. Our information about the coal used, production per retort and day, fuel, tar, and ammonia is neither so full nor do the figures apparently represent as long a period of uninterrupted working as is desirable. But the figures so far known are very similar to those obtained with the Dessau retort. Mr. Duckham spoke at Liverpool on Nov. 30, 1907, of an average result of 13,021 cubic feet of 14·20-candle power and 546 B.Th.U.* gas corrected to [?]; while the October figures for Oberspree were 13,478 cubic feet of 10·80-candle power and 546 B.Th.U.* gas corrected to 59° Fahr. and 30 in. Bar. One cannot, of course, in a small gas-works, keep these big furnaces always fully in action; so that for the short periods during which this is possible the results become still more favourable. In the average of eleven consecutive December and January days, for instance, the production per ton was 14,440 cubic feet of gas of 545 B.Th.U. (59° Fahr. and 30 in. Bar.), and the output per retort 15,500 cubic feet. The 5-metre retorts not being favourable as regards illuminating power, we shall have to look to Dessau, where clauses are in force in this respect.

* A curious coincidence.—E. K.

TABLE VII.—*Average Results in Dessau, October, 1907.*

Gas produced at 15°C. and 760 mm. Bar. 59° Fahr. and 30 in. Bar.				Illuminating Power, Carpenter Burner.	Gas at 0°C. and 760 mm. Bar. 32° Fahr. and 30 in. Bar.	
Per 1000 kilos.	Per Ton.	Per Retort per Day.			Calorific Power.	B.Th.U.
Cubic Metres.	Cubic Feet.	Cubic Metres.	Cubic Feet.	Candles.		
315	11,292	398	14,056	18·36	5613	631

Coals used (all quite second rate):—

Westphalian	33·1 per cent.
Leverson-Wallsend	28·9 "
New Leverson	38·0 "

The differences are so small that I should think a simultaneous trial with exactly the same coals, testing methods, &c., will be necessary in order to show that the gas results of the one system are a hair's breadth ahead of the other.

After the discussion on my paper during the 1906 meeting of the Institution of Gas Engineers, I said that I could not imagine, from a chemical point of view, why a piece of coal moving slowly through a retort was carbonized to better advantage, and under better conditions than a piece remaining stationary during the process. In the first case, the coal would pass slowly through different stages of heat; in the second, different stages of heat would pass over the piece of coal. The effect should be the same. In view of actual results, I do not see any reason to alter my opinion. But if two systems are on the same footing with regard to primary cost, wear and tear, carbonizing results, reliability, &c., I am, on principle and by experience, inclined to prefer the less complicated solution.

In expressing this view, I will by no means disparage the merits of Messrs. Woodall and Duckham, who, with such admirable skill and enthusiasm, have devoted themselves to the old problem of continuous carbonization. No doubt engineers of a mechanical turn of mind will prefer it, as doing away entirely with human labour; and the whole gas industry will benefit by the healthy competition of several rival systems.

Standard of Quality for Gas.

A few remarks may be added with regard to the proper standard of quality for gas. In Berlin, about half of the gas sent out is used for other than lighting purposes, and the second half for incandescent burners. There can be no doubt, therefore, that in Germany the calorific value of the gas is of exclusive importance. But I should think that in England also it ought to be considered first and foremost. I dare say that in that country also about half of the total output is used for heating and household purposes, and at least half of the rest for incandescent lighting. In spite of that, the universal standard was, and still is, the illuminating power. Now, at the time when this standard was introduced, only ordinary coal gas was known, and it was a matter of course that, within certain limits, the heating value corresponded to the illuminating power. In Berlin, we regard 570 B.Th.U. (59° Fahr. and 30 in. Bar.) as about equivalent to 14-candle coal gas. By the introduction of carburetted water gas, however, the old relation between illuminating power and heating value was altered; this gas showing, for the same illuminating power, a considerably reduced heating value. I dare say that, with one or the other of modern gas-producers—viz., verticals, coke-ovens, &c.—this discrepancy, which may be due to a very slight percentage of heavy hydrocarbons, will be also found; so that a 14-candle gas is not one in the old sense, but one with considerably less heating power, or with so much less real value to the majority of the consumers. I arrive, therefore, at the conclusion that if the illuminating power as a standard be not given up altogether, it is obviously necessary to introduce heating power clauses as well, in order to protect the interests of the consumers.

TABLE VI.—*Comparison of Five-Metre and Four-Metre Retorts.*

October, 1907.	Gas 15° C. and 760 mm. Bar. 59° Fahr. and 30 inches Bar.				Illuminating Power, Carpenter Burner, at 15° C. and 760 mm. Bar. 59° Fahr. and 30 in. Bar.	Gas at 0° C. and 760 mm. Bar. 32° Fahr. and 30 in. Bar.	
	Production.					Calorific Power.	B. Th. U.
	Per 1000 Kilos.	Per Ton.	Per Retort per Day.				
	Cubic Metres.	Cubic Feet.	Cubic Metres.	Cubic Feet.	Candles.		
Five-metre retorts.	376	13,478	424	14,974	10·80	5136	577
Four-metre "	315	11,292	398	14,056	17·70	5613	631

The Munich Chamber Oven.

The Munich chamber oven is, according to my idea, bound to be a failure, for the simple reason that its primary cost is prohibitive, at least with gas companies for whom, as a matter of course, economic principles are of first consideration. One furnace for a daily production of 5000 cubic metres is stated to cost 65,000 marks.

Conclusion.

The foregoing comparison was for me quite a peculiar task, in so far that I had to dwell at length on the shortcomings of those very Coze furnaces for which the late Mr. E. Drory and myself had fought so many times. The question arises, therefore: Have we done right to erect large installations of Cozes, whereas other engineers may have been waiting for the advent of the vertical? The answer must be, as I take it, entirely in the affirmative. The Coze furnaces were, as has been shown by our comparison, a long step in advance, and a step in the right direction, too. The Coze furnaces have in the course of years earned large sums of money, and placed us in an excellent position when labour conditions, in consequence of the recent boom, became very difficult. They enabled us, for instance, to introduce the eight-hour day without any additional outlay.

Adhering from the beginning to the principle of large units and simple constructions, we are satisfied with the Coze furnaces, and are, so far, more than satisfied with the verticals, as Mr. E. Drory predicted we should be, when, as almost a dying man, he saw the first trial settings. The vertical furnace for which he declared himself from the beginning with all the enthusiasm of his fervent nature, was the last great interest of his life.

DISCHARGE OF WATER FROM MINUTE ORIFICES.

At the Winter Meeting of the Association of Water-Works Engineers, a paper on "The Influence of the Thickness of the Pipe Wall on the Rate of Discharge of Water from Minute Orifices Piercing the Pipe," by Mr. W. R. Baldwin-Wiseman, M.Sc., Assoc.M.Inst.C.E., was included in the programme; but time did not admit of its discussion. The author said his contribution, of which we now give an abstract, represented several thousand experiments; and he promised that when he had made further trials he would present a supplementary paper.

During the past year, the author had occasion, in the course of an investigation upon which he was engaged, to determine the discharge of water at different pressures, ranging from 10 lbs. to 60 lbs. per square inch, from circular orifices of extremely small diameter, piercing pipes of moderate thickness; and as the results seemed to give values of the coefficient of discharge varying more or less directly with the ratio $t : d$—where t is the thickness of the wall and d the diameter of the orifice—he thought a brief note might be of some interest to the members of the Association. Before describing his experiments and the deductions therefrom, he briefly outlined the work of previous investigators in regard to the coefficient of discharge, and then passed on to the subject-matter of his paper.

The experiments were conducted on a stepped brass pipe of ten steps, with external diameters ranging from 2·021 nches to 0·88 inch, and with an internal diameter of 0·421 inch constant throughout its length; being accurately centred, and turned and polished from a solid cylindrical bar 12 inches long. This was connected on the right to a 12-feet length of ½ inch internal diameter iron pipe, which, fitted with a cock at its remote end and with a wheel-valve at an intermediate point nearer to the experimental pipe, communicated with a service-pipe on the mains of the Southampton Water-Works. On the left, the experimental pipe was connected to the outlet-pipe of an accumulator slightly modified from one described and illustrated in papers by the author in the Proceedings of the Institution of Civil Engineers—a steel disc closing the base of the reservoir. The loads being readily adjustable, any desired pressure, ranging from 10 lbs. to 70 lbs. per square inch, could be easily maintained. Accurate Bourdon pressure-gauges, recording up to 120 lbs. per square inch, by increments of 1 lb., were mounted on the connecting-pipes between the experimental pipe and the cock and wheel-valve on the left and right of that pipe respectively.

In each stepped length of pipe a hole 0·039 inch diameter was drilled, and its diameter was subsequently successively enlarged to 0·040, 0·041, 0·042, 0·045, 0·050, 0·055, and 0·058 inch; the discharge being gauged several times for each change of diameter at pressures ranging from 10 lbs. to 70 lbs. per square inch, by constant increments of 10 lbs. each. At the conclusion of each series of experiments, the hole was carefully plugged and sealed with molten metal, and the interior smoothed. Also, after each drilling or enlargement, care was taken to remove any roughness or projection made inside by the drill. The thickness t of the pipe wall varying from 0·799 to 0·228 inch, and the diameter d of the orifice ranging from 0·039 to 0·058 inch, no less than 80 ratios of $t : d$ were obtained, ranging from a maximum value of 20·5 to a minimum value of 3·9.

The general nature of the results is shown in the following table, from which it will be seen that, though the diameters may vary considerably, for a similar ratio of $t : d$ the coefficients of discharge are approximately the same at all three of the pressures recorded; also that the coefficients are generally higher for large than for small values of the ratio $t : d$.

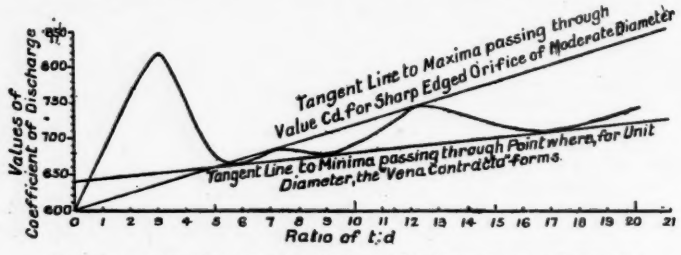

Values of Coefficient of Discharge
850
800
750
700
650
600
Tangent Line to Maxima passing through Value Cd for Sharp Edged Orifice of Moderate Diameter
Tangent Line to Minima passing through Point where, for Unit Diameter, the "Vena Contracta" forms.
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21
Ratio of t:d

Diagram showing Variation of Coefficient of Discharge with the Ratio t : d.

Diameter of Orifice in Inches.	Thickness of Pipe Wall in Inches.	Ratio of $t : d$.	Coefficient of Discharge at Pressures of			Discharge of Orifice in Cubic Feet a Second at Pressures of			Discharge of Orifice in Gallons a Day at Pressures of		
			60	40	20	60	40	20	60	40	20
			Lbs. per Sq. In.			Lbs. per Sq. In.			Lbs. per Sq. In.		
·040	·604	15·1	·728	·755	·781	·00060	·00051	·00037	323	275	199
·042	·667	15·9	·730	·761	·791	·00066	·00056	·00041	356	302	221
·040	·474	11·8	·748	·787	·833	·00062	·00053	·00040	334	286	216
·050	·604	12·1	·741	·781	·818	·00095	·00082	·00061	512	442	329
·042	·352	8·4	·678	·680	·670	·00062	·00050	·00035	334	269	189
·050	·419	8·4	·679	·675	·672	·00087	·00071	·00050	469	383	269
·042	·293	7·0	·682	·678	·711	·00062	·00050	·00037	334	269	199
·058	·419	7·2	·681	·681	·684	·00118	·00096	·00068	636	517	366
·058	·352	6·1	·669	·663	·666	·00116	·00094	·00067	625	507	361
·041	·228	5·6	·664	·662	·670	·00057	·00047	·00033	307	253	178
·058	·293	5·0	·670	·668	·665	·00116	·00094	·00066	625	507	356
·045	·228	5·1	·672	675	·672	·00070	·00057	·00040	377	307	216

The author explained that if a curve were drawn for any one pressure similar to that of the accompanying diagram, which was drawn for the pressure of 60 lbs. per square inch, with the ratios $t : d$ for abscissæ and corresponding values of the coefficient of discharge for ordinates, it would be found that there are a series of maximum and minimum values of the coefficient alternating in a regular way.

In this particular respect the curve shown is of additional interest, in that a line drawn tangential to it, through the maximum values of the coefficient of discharge (C_d), for values of the ratio $t : d$ greater than 3, passes through the value of C_d for a sharp-edged orifice—that is to say, through the value of C_d corresponding to the ratio $t : d = 0$, while the common tangent to the minimum values of C_d in the same range cuts the curve at the point for which the ratio $t : d = 0{\cdot}5$, which is equivalent to that of the distance from an orifice of the *vena contracta* to the diameter of that orifice.

The author considers this variation, which was most marked and regular throughout the whole range of the experiments, may be due to an inability in the varying lengths to maintain a constant reduced pressure in the region surrounding the *vena contracta*, or it may be that the walls of the pipe set up a reflection of the stream-lines at points along its length, giving rise to some type of periodic phenomena; and he hopes at some future time to again attack this problem, by conducting a still more extensive series of experiments.

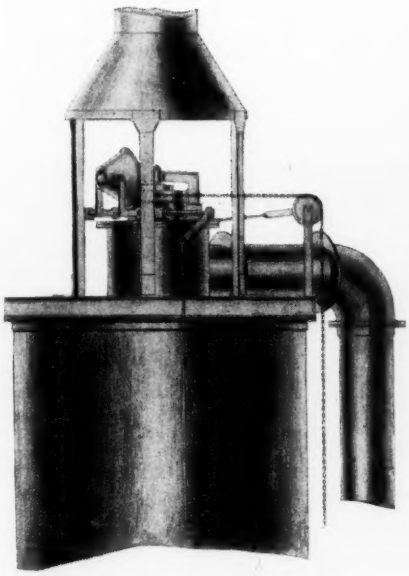
THE CROYDON ARRANGEMENT OF STACK-VALVES FOR C.W.G. PLANT.

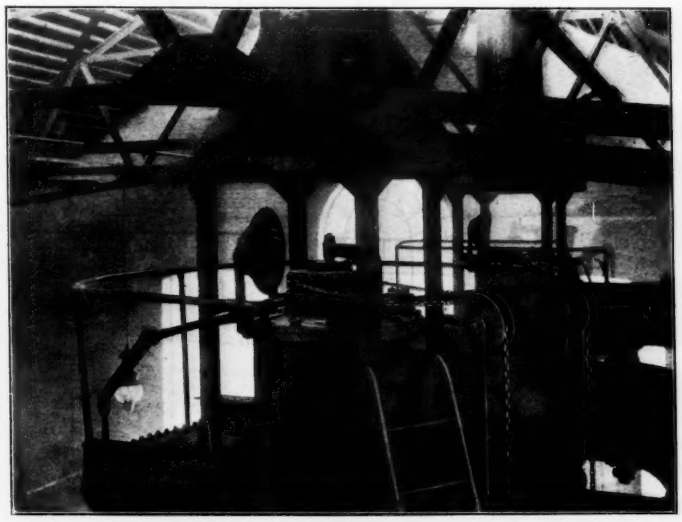
By James W. Helps.

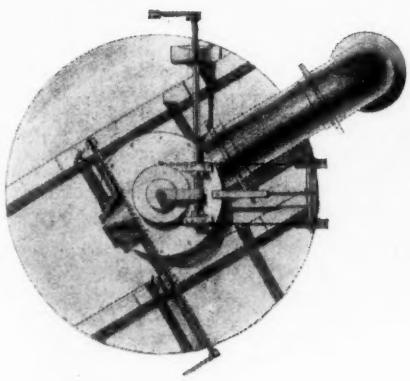
I notice in your issue of Dec. 31 a description of an invention patented by Mr. G. W. Bailey, of Folkestone, having for its object the prevention of leakage at the stack-valves of carburetted water-gas plants.

We have had a very similar arrangement in use at the Croydon works for the past two or three years, which, while having the advantage of being both simpler and less costly than Mr. Bailey's device, is, I think, calculated to do its work somewhat more efficiently, as the whole weight of the valve acts on the seating during the period of rotation, while in Mr. Bailey's plan it seems to me that the action of the bevel-pinion clearly has a tendency to keep the valve slightly off its seating during the process of "grinding-in."

The drawing and photographs sent herewith will make the process sufficiently clear, without further description. It will, however, be seen that the operator standing on the stage-floor is able, by pulling each chain alternately, to rotate the valve







(which is suspended on a loose pivot) one half-turn at each movement, and thus keep the seating thoroughly clean.

The drawing also shows another arrangement which has proved extremely useful. Experience demonstrated to us that during the process of clinkering the in-rush of air at the open doors, when the stack-valve was full open, was so rapid that the heat produced at the bottom of the generator was sufficient not only to cause great inconvenience to the men at work, but also to quickly burn away the cast-iron frame immediately over the doors. To overcome this difficulty, we devised a secondary stack-valve, having in it an opening of such a size as would just take away the products of combustion without allowing flame to issue at the doors. Experiment showed that the most suitable size for this opening was about 4 inches in diameter.

This stack-valve is worked from the stage-floor, and in much the same way as the ordinary valve. I need hardly say that, before closing it, it is necessary to open the valve at the bottom of the generator, and also the clinkering doors.

I think the drawing is sufficiently clear to render any further description unnecessary.

I may, in conclusion, say that neither of the above arrangements is patented; and it is not at all unlikely that other gas engineers have similar devices of their own for overcoming the same difficulties.

ILLUMINATING GAS FROM COKE-OVEN PLANTS.

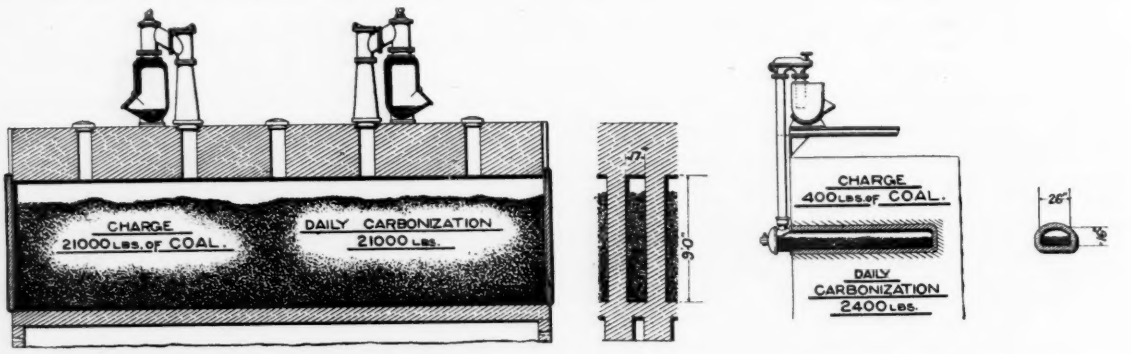
By Archibald S. B. Little, of St. Louis, U.S.A.

(*Concluded from p.* 38.)

The Gas End of the Business.

When properly purified, the rich gas given off during the production of the coke is worth, in the United States, from 3s. 4d. to 4s. 2d. to 1000 cubic feet; and it is almost inconceivable how any operating company can consent to the wasting of this by the old process. Yet thousands of plants are in operation to this day where no care is taken of the gas. The heat units from a ton of coal, in the form of the hitherto wasted gas, are enormous; and there is no reason why they should not be converted into cash, while at the same time the collection of the products of distillation would prevent the wholesale contamination of the atmosphere. Briefly put, the output of a bye-product coke-oven plant is, for every 100 tons of coal carbonized, 75 tons of coke, 1000 gallons of tar, 2300 lbs. of sulphate of ammonia, and 450,000 cubic feet of surplus gas.

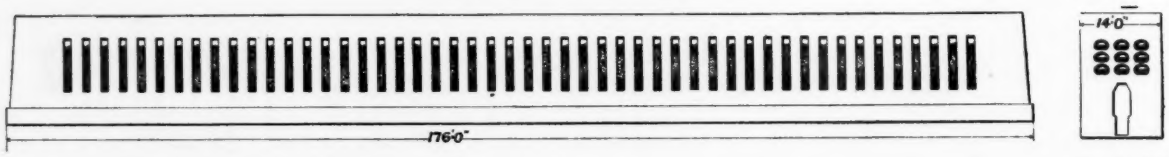
In comparison with the old bee-hive oven, 50 ovens are equal to 200 in the old style. Examined with back-to-back regenerative beds of retorts handling (say) 500 lbs. of coke per four to six



Longitudinal Section. Transverse Section. Longitudinal Section. Transverse Section.

Bye-Product Oven. **Gas-Retort.**

Comparison of Bye-Product Oven and Gas-Retort.



A Battery of Fifty United-Otto Ovens Carbonizes 525 Net Tons of Coal per Day.

A Bench of Nine Retorts Carbonizes 9 Net Tons of Coal per Day.

Comparison of Battery of Bye-Product Ovens and Bench of Gas-Retorts.

hour charge there is no comparison. It must be evident that it is more economical to handle larger charges varying from 15,000 to 25,000 lbs. of coal. Mr. Isaac Carr, of Widnes, I believe once caused great amusement by his remark at one of the Institution meetings, when, after an animated discussion on mechanical charging and discharging machinery, he said something to the effect that the progress in recent years had been remarkable, and at the existing rate it would soon be possible to employ machines at a cost for handling material about equal to what his manual methods entailed. It is true that on horizontal retorts the small units handled by machinery bear no striking dissimilarity in cost to the old man-and-shovel methods, when we take into consideration the capital and up-keep charges. This cannot be said truly of the coke-oven method of making gas. To show at a glance the relative sizes and output of the two systems of making gas, two drawings to scale are shown. I am indebted in this particular to the United Coke and Gas Company, of New York. I need only add that the gas-retort is charged with about 500 lbs. of coal four to six times per 24 hours, giving a total of not more than 3000 lbs. of coal per diem. The United-Otto coke oven takes a charge of 21,000 lbs. every 24 hours.

When the oven is charged, the rich gas at first given off is taken through vertical pipes to the gas-collecting mains, which are controlled by valves. Only when the two kinds of gases are separated does the plant contain duplicate mains, as in the other case, when all the gas is used for fuel purposes, only one main is necessary. In the first main, the gas which is rich in illuminating and heating value is taken off; and this is used for outside distribution purposes. It is claimed that this system of separating the gases is a patent one, owned by the United Coke and Gas Company; and anybody interested in this fact can get full particulars in a copy of United States patent, No. 627,595. As before stated, the two portions of the gas are kept entirely separate through the subsequent condensing plants, which are usually arranged to handle each kind of gas in apparatus built in parallel. The complete plant for gas-making includes condensers, exhausters, scrubbers, tar extractors, and the appliances usually found in a gas-works; and also machines for the treatment of the ammoniacal liquor, tar, benzol, and cyanides.

In operating the plant, about 25 hours 20 minutes is the time the coal is left in the retort. At the start, 22-candle power gas is given off; and this decreases in illuminating value during the time it is collected in the rich-gas main, as follows—the total time being about ten hours. At the end of the third hour, the gas equals 20 candles, and at 4 hours 18 candles, from which time it quickly depreciates, as specified; 5 hours, 17 candles; 6 hours, 16; 7 hours, 15¼; 8 hours, 15¼; 9 hours, 14¾; 10 hours, just over 14. During the same periods the calorific value of the gas is—

Start	= 780	B.Th.U.	per	cubic	foot.
3 hour	= 760	,,	,,	,,	,,
4 ,,	= 756	,,	,,	,,	,,
5 ,,	= 754	,,	,,	,,	,,
6 ,,	= 700	,,	,,	,,	,,
7 ,,	= 690	,,	,,	,,	,,
8 ,,	= 686	,,	,,	,,	,,
9 ,,	= 650	,,	,,	,,	,,
10 ,,	= 646	,,	,,	,,	,,

At the end of the ten-hour period, the rich-gas main is cut out; and during the time it collects the gas shows an average of about 18 candles and 722 B.Th.U. per cubic foot of gas—the quantity being from 4200 to 4500 cubic feet per short ton of coal (2000 lbs.). In the remaining 14 hours, the average calorific value of the gas in the fuel main is about 550 B.Th.U. per cubic foot, of candle power varying, in direct proportion to the time, from about 13½ to 3; the quantity of gas being about 5000 feet to the short ton. In all cases the gross heating value is given. It must be remembered that these results were obtained from the distillation of a coal which could not accurately be termed gas coal (in our acceptance of the term).

One peculiarity about the gas from these coke-oven plants is that, owing to the high percentage of methane, the gas is much better adapted to high-pressure distribution than mixed coal and water gas, and carries its illuminants much better. Natural gas, of course, is the ideal for long-distance transmission, though not from an illuminating point of view. I recently inspected natural-gas plants in Arkansas, and was greatly surprised at the poor results of lighting. Incandescent mantles of the usual kind are no use for lighting; and I find the value of the gas for illuminating purposes is from one-third to one-quarter as good as 16-candle power coal-gas. My experience with the Otto-Hoffman coke-oven is that it gives much better results than those obtained in other ovens as published recently in the "JOURNAL." In respect of nitrogen especially, the Otto gas is much better, and is about equal to retort-made gas, which seems to be accomplished by proper methods of oven handling and the subsequent treatment of the gas. For the sake of comparison, figures are published to show the analyses of various kinds of gas:—

Analyses of Illuminating Gas from United-Otto Coke-Ovens, Retort Coal Gas, and Carburetted Water Gas.

	Coke-Oven Gas.	Retort Coal Gas.	Carburetted Water Gas.
Hydrocarbons	5·8	3·83	11·32
Methane	40·8	35·90	20·48
Hydrogen	37·6	48·49	29·35
Carbon monoxide	5·6	6·61	33·19
Carbon dioxide	3·7	·12	·17
Oxygen	·4	·00	·32
Nitrogen	6·1	5·05	5·17
	100·00	100 00	100·00
B. Th. U. per cubic foot	730·00	669·00	719·00
Specific gravity	·508	·401	·528
Candle power	17·5	15·5	20·7

It will be seen that the coke-oven gas has a very high heating value; but it has a larger proportion of carbonic acid than the others—due to the fact that no lime purification has been carried out, which would, if done, make the specific gravity about ·470, and the illuminating value about 20 candles.

A few notes on the cost of operating a modern plant will not be out of place; and I have assumed one consisting of 100 ovens, each capable of carbonizing daily 7½ net short tons of coal. [In all figures the 2000 lbs. ton is referred to.] The plant would thus have a capacity of 750 tons of coal per 24 hours, which I have taken at a nominal cost of 5s. per ton delivered. It is thus seen that the cost of the coal will be £187 10s.; and the labour charges (from actual results carefully collected by the writer), also the cost of repairs and all other capital charges, would be not more than 3s. 4d. per ton—making the cost per day £125, or a total of coal and operating costs of £312 10s. per 750 tons or per day. The amounts to be credited for bye-product returns, including recovery of ammonia, tar, and benzol, and the surplus gas, sold at full value, amount to £200 or thereby—leaving a balance of

£112 10s., representing the cost of the coke produced. If we take this to be two-thirds of the coal, we have for disposal 500 tons of coke, the cost of which is shown by the above figures to be at the rate of 4s. 6d. per ton. If, on the other hand, we substitute for the price of gas sold for fuel the suggested charge of 1s. per 1000 cubic feet when used for illuminating purposes, the total credit would be £267—not £200. This would leave a balance of £45 10s., representing the cost of the 500 tons of coke produced, equal to about 1s. 10d. per ton.

The Semet-Solvay process differs only in detail from the Otto-Hoffman type of oven, the principle being the same. On the first-named, the ovens are usually built in benches of from 30 to 40, with a set of boilers between each two stacks, for absorbing the heat from the gases after they have passed through the regenerator flues. Individual retorts are 35 feet long, 16½ inches wide, and 7 ft. 6 in. high, to hold about 7 tons of coal; the charge generally being kept in for 24 hours. Charging is done by means of an electrically-operated car, which travels along the top of the bench; and the coal is fed through holes in the roof, being levelled by a machine at the end, so as to leave room for the gas to pass off. In England, the writer was connected with a Darby plant, using washed powdered coal; and as the quality was not suitable for making a coke of sufficient density or strength, it had to be subjected to compressing in a wet state before being put into the oven. The whole operation was quite automatic—being performed by an electrically-driven tamping machine, which traversed backwards and forward; while at the same time an automatic reversing carriage on a band conveyor spread coal in front of it. The compressed mass, on the plant employed by the Wigan Coal and Iron Company, was then pushed into the oven by means of a ram.

The gas at first given off on all these plants is of a yellow or brown colour, and is very rich in methane and hydrogen, accompanied by watery and tarry vapours. Subsequently the composition changes considerably—the methane decreasing, while the hydrogen and carbonic oxide increase. The mains are in one length to each battery, so as to equalize the pressure of gas in the retorts. Inside there is usually placed a toothed diaphragm, under which the gas passes after bubbling through the water seal—thus taking out the soot and heavy tars. After this, the process is much like what we have in gas-works, so that a special description is not necessary. Although the disadvantages of the system may be obvious, I think it advisable to record them briefly. It is understood that the operation of the ovens requires a combination of metallurgical and chemical skill, with good engineering knowledge of a highly-specialized kind; but more than this, a commercial ability of the best order is needed to make the business financially successful. For instance, the marketing of the bye-products is a very important part of the scheme, which requires the executive to have familiarity with industrial concerns into which the bye-products enter. It is only by the presence and preservation of such markets, and the regulation of supply to maintain the sale at fair prices, that the extensive working of bye-product coke-ovens can be made possible.

Perhaps the point requiring most consideration is the disposal of the tar, as at present there is a varying demand, which is too often so limited that an overplus is left on the market for sale. To burn the surplus is, of course, to get rid of it; but this reduces its value to the vanishing, or purely nominal, point. Separating into pitch and oil, we get from 60 to 70 per cent. of pitch, and a balance of coal tar products, such as anthracene, creosote oil, naphthalene, benzol, &c. I believe that the separation by distillation in this way could be carried on in a works of this kind much more economically than in a gas-works. It is to be hoped so, because it is generally known that gas engineers who carry on this business in their works have a job to show anything like reasonable profits. In the larger and more complete plants that would be needed, it would pay to engage men to look after the work who would have the highest chemical skill. As worked at present in gas-works, it is the gas engineer who has to look after the manufacture, and the time necessary for the purpose can be ill-spared. It must not be lost sight of that a big outlay of capital is needed to make a sound, economic plant to work in conjunction with the coke-ovens. It must be designed to take care of the carbolic acid, as this can be sold as a base for picric acid and similar substances used in the manufacture of high-grade explosives; it also finds a ready sale to manufacturers of disinfectants.

In England, creosote oil is used in great quantities by such firms as Messrs. Burt, Boulton, and Haywood for preservation of timber; and as lumber becomes more scarce, greater quantities will be used for creosoting purposes. Perhaps the best outlook for the tar market is in the extended use of the material for making and preserving roads. On plants, such as that at Dudley Port, where, adjoining the steel plant, there has been erected a "Tarmac" manufactory, a great quantity of tar and pitch can be used. Anybody who has seen the tar-macadam roads laid by the Company at Brighton and other parts of England will hope much for a better tar market in the future, because the roads formed of this mixture of broken furnace slag, resin, and tar, are about equal to anything that I have ever seen, in point of appearance, comfort, and durability.

Then, again, an increased demand for tar is likely to be caused by the more extensive use of "Belfast" and other forms of combined wood and felt tar-covered roofs. These are undoubtedly excellent for certain kinds of factories; and it is surprising how immune they are from fire risks when regularly tarred and sanded. The writer used one in a foundry, where a shower of sparks rained in it for several hours every day. On one occasion it caught fire, but was put out in a few minutes with some buckets of water; and the damage cost about £5. In America there is not much call for tar in briquette plants—at least, just now; but in England enormous quantities are used for the purpose, and the amount is very likely to increase as coal of first-class quality decreases in quantity. For domestic use there will ever be a place for these briquettes, offering really excellent possibilities to the tar producer.

The uses to which ammonia and products can be put are well known; and there should be no difficulty in disposing of all that would be made on coke-oven plants. In America during 1906 bye-product coke-oven plants produced about 130,000,000 lbs. of ammonia in the form of sulphate, which amounted to twice the entire output of the country in 1902. In gas making, about half the output is burned under the ovens, leaving about 2½ cubic feet to the pound of coal carbonized, which is suitable for illuminating purposes. There is absolutely no reason why the gas cannot be used entirely for illuminating purposes, just as easily as the gas from our present benches. Its constituents are the same; and it can be just as readily enriched, when this is rendered necessary, by the coking of coals which are low in illuminating value. The enriching medium can be produced from the benzol obtained in distilling the tar.

The greatest drawback to the extensive adoption of coke-ovens is how to dispose of the coke in a country where coke as a fuel in domestic circles is almost unknown. However, it must be remembered that the same difficulty was encountered in America at the outset. But, by the introduction of business-like methods, this was soon overcome; and now it is quite easy to sell all the coke made, and at good prices. Just consider what it would mean to burn millions of tons of this smokeless fuel in place of the coal now used annually in London! To do it a complete plant would have to be installed to crush and size the coke, as was the case at Camden, New Jersey. In a previous article I hinted at this difficulty, and the way in which it was overcome; and I now give further particulars.

First, I may say, every plant is run to make the very best quality of coke, as this is conducive to the best returns from the bye-products. In these ovens a short, stodgy coke is produced, very unlike the shape of bee-hive "finger" coke, and it is more suitable for furnace work. It is found after many years' trial that for foundry cupola use the coke gives results much superior to those

Plant for Crushing Domestic Coke at the Camden Coke-Ovens.

obtained from bee-hive coke. Just why this should be, I do not know. At the same time, for blast-furnace work, figures can readily be obtained from ironmasters who have for years been using coke made in Otto-Hoffman, Semet-Solvay, Coppé, and Darby ovens.

One has seen, more especially in recent years, much greater attention given to the coke question by gas companies; and in a large number of works elaborate crushing and sizing plants are in use. Out here in the United States, properly sized coke is coming to be recognized as a substitute for soft coal in domestic circles; and it is to a large extent making an effort towards a permanent solution of the smoke problem. Up to within the last few years, anthracite coal has held the public favour for the usual industrial purposes, such as baking, drying, heating, &c. But it is quickly being found out that coke made in ovens is fully equal to it weight for weight, and possesses the advantage of lighting quicker, while retaining the heat equally well; and in point of economy, uniformity, and cleanliness, it is far and away ahead of any kind of coal. To my mind, the future will resolve itself into a question of not "What kind of fuel will be used," but "Who is going to supply the coke market." Coalite, and other similar half-baked goods, cannot compete with the fuel from high-class coke-oven and bye-product recovery plants.

This is a point that must be kept before gas engineers all the time, as, if they do not tackle the problem, somebody else will. Maybe the present system of granting an exclusive franchise to gas companies will delay the early adoption of large plants to supply a number of towns from a distance. But there is no saying how long this system is going to continue; and it cannot be that it is unalterable, because with new methods of manufacture and the need for cheap gas for power, light, and all heating purposes, together with a cheap, solid fuel better than coal or gas-works coke, it will be a case of necessity to establish a number of coke-oven plants at the head of suitable collieries.

USE OF HEAVY HYDROCARBONS FOR LIGHTING.

At a recent Meeting of the Paris Academy of Science, M. Denayrouze submitted a communication on the subject of the "Employment of Heavy Hydrocarbons for Lighting," in which he gave the result of researches carried on by him for some years on the production of light by the incandescence of hydrocarbons other than alcohol and petroleum. His observations have lately been published in the "Comptes Rendus," from which the following particulars have been taken.

After obtaining good results with benzol, M. Denayrouze succeeded in profitably utilizing a large part of the complex hydrocarbons of coal tar. The use of these liquids appeared to him to present such great advantages, that before bringing the subject under the notice of the Academy he considered it advisable to have his photometric tests verified at the Testing Laboratory of the Conservatoire des Arts et Métiers. The reports made by the specialist departments of the Laboratory demonstrated that with the new liquids the unit of light—*i.e.*, the carcel-hour—was obtained with an expenditure of not more than 5 grammes of oil. Moreover, the ignition-point of these substances was much higher than that of petroleum and *a fortiori* of alcohol; so that they could be handled with perfect safety.

The liquids specially referred to by M. Denayrouze were the products of double distillation; one being obtained at 140° to 200° C., and the other at 200° to 270° C. The first was extracted from medium commercial oil, and the second from heavy oil carefully rectified to remove the parts most refractory to the action of moderate heat. M. Denayrouze expressed the opinion that the employment of these liquids would cause a decided reduction in the cost of light. In fact, the crude oils from which the final product of 80 to 83 per cent. utilizable hydrocarbons was extracted were bye-products in several industries. As they were very abundant, and were now employed for making road surfaces, treating wood for its preservation, and other purposes, they were sold for very little. He thought that a comparison of the prices of light hydrocarbons with those of the crude heavy kind justified the supposition that the cost of the lighting liquid would drop an average of at least two-thirds. Moreover, there was little fear of any artificial rise in the price of the materials from which the new liquids were obtained. The quantity of tar annually treated in England alone is 450,000 metric tons, each of which, according to M. Denayrouze, would yield as much light as 35,000 cubic feet of gas.

In order to suitably volatilize these slightly volatile substances, M. Denayrouze constructed special apparatus whereby it was possible to decrease by about one-half in weight the amount of liquid necessary to produce the unit of light; and he thought this economy justified the conclusion that incandescence by means of hydrocarbons would effect a change in the lighting of rural districts similar to that which incandescent gas has produced in towns. He recognized that there was a certain amount of inconvenience attending the hydrocarbon system of lighting, arising mainly from the difficulty of ignition. But he thought this could be overcome by the adoption of some method of automatic lighting, either by gas or electricity, both of which are now to be found in towns. At all events, he considered that his system would prove useful as a permanent source of light which would be available in the event of the failure of the one relied upon. With regard to cost, taking the value of a metric ton of heavy oil at 200 frs. (£8), he reckoned that the expense per carcel-hour with his new apparatus would be only a small fraction of what it is by the ordinary methods.

THE "DUPLEX" GAS-RADIATOR.

In the utilization of gas for heating purposes, it is customary to employ the blue or bunsen flame, which is generally supposed to answer the purpose better than the white flame. There is, however, one drawback to the use of the former, and that is that its combustion is in some cases productive of an unpleasant odour. Though the difficulty has been to a large extent overcome by causing the flame to pass through or impinge upon material which is raised to incandescence, the objection to which reference has been made has not been entirely removed. Recognition of this fact led Mr. C. J. Morehouse, of No. 37, Southampton Row, W.C., to endeavour to so employ a white flame as to make it as useful as a blue one as a heating agent, and at the same time render it odourless and enable it to be utilized without necessitating the provision of flue connections. The result of his investigations has been the production of the "Duplex" radiator, in which ordinary illuminating flames are used, each being enclosed in a tube of sheet metal, so that a considerable amount of radiating surface is provided. In the construction of the radiator, a number of baffle-plates are mounted in the tops of the tubes, placed a short distance apart, so that the hot air will flow up round the edges of the plates, leaving the space between the latter to form heating chambers—thus constituting a large reservoir of superheated air. A peculiar feature of these baffle-plates is that their edges are notched to allow the teeth to come into contact with the tubes in which they are enclosed, for the direct transmission of the heat to and through the tubes, and at the same time provide just sufficient draught to ensure the necessary supply of air to the flame. The base of the radiator is provided with a double floor, and the air entering the combustion chamber is first heated between the floors, so that the gas-flames burn in a very hot atmosphere. There are thus secured two causes conducive to thorough combustion, as the warm atmosphere in which the gas burns aids it, and the plates on the tops of the tubes prevent a strong draught, which would draw the gas away from the flame before it had time to completely burn. Mr. Morehouse claims that in this way all the gas is consumed; and as thorough combustion leaves nothing to create an odour, the radiator can be used in a living-room, bed-room, or sick-room not only without any disagreeable effects, but even with beneficial results apart from the heat which is obtained from it. As the baffle-plates are mounted in the tops of the tubes, the heat generated from the flame will be retained in the lower part of the tubes until this part will become much hotter than the upper parts; and, as a result, the heat will be radiated out over the floor more than from the top of the radiator—thereby increasing the circulation of air from the floor, and ensuring not only comfortable heat for the occupants of the room, but pure air in the lower portion of the apartment. The tubes are made of steel and triple-coated with flintstone enamel in various solid colours. The advantages claimed for the "Duplex" radiator are that it gives the maximum heat at a minimum cost; that the heat can be regulated to a degree; that no special fittings are required; and—perhaps most important of all—that it is absolutely odourless.

'The Illuminating Engineer."—We have this week to welcome the appearance of a new monthly publication entitled "The Illuminating Engineer," the Editor of which is Mr. Leon Gaster, who is well known to readers as a strong advocate for the creation of a profession bearing the same name as the new paper. The present issue contains a number of articles bearing on various kinds of lighting and allied subjects; and it is evidently intended to make the scope of the paper as wide as possible.

The Late Mr. William Brown and Murdoch.—A writer who signs himself "An Ardent Admirer of Murdoch" has sent to the "Ironmonger" a letter on the subject of the paragraph which appeared in the issue of that publication for the 4th inst., as well as in the "JOURNAL" and many other papers, associating Mr William Brown, the last of the Soho workers, whose death in his 86th year had recently occurred, with William Murdoch, the pioneer of gas lighting. He points out that Murdoch was born on Aug. 21, 1754, and died on Nov. 15, 1839. Assuming Mr. Brown's age to have been as stated, he was then only seventeen years old; and as Murdoch left the service of Messrs. Boulton and Watt in 1830, he could hardly have been "a personal friend and co-worker" with him. The writer says that the statement in regard to James Watt, jun., is quite another matter, as he and young Boulton continued to carry on the business at the Soho Works long after the deaths of "The Mighty Three" (Boulton, Watt, and Murdoch) who have been so splendidly commemorated in the Parish Church of Handsworth—Watt by a magnificent statue of white marble by Chantrey, and Boulton and Murdoch by fine marble busts by the same sculptor.

LONDON AND SOUTHERN JUNIOR ASSOCIATION.

Last Friday evening, the members of the Association held a meeting at the Cripplegate Institute, Golden Lane, E.C., at which two short papers were read and discussed. The chair was taken by Mr. W. J. Liberty—in the absence through indisposition of the President, Mr. W. Upton—and during the proceedings he announced that next Saturday's visit is to be to the tar-works of the South Metropolitan Gas Company, at East Greenwich, and not to their chemical works, as was inadvertently stated in the notices sent out to the members.

CARD-INDEX SYSTEM AS APPLIED TO GAS-WORKS.

Mr. J. R. Gale gave a description of the card-index system which is in use at the works of the North Middlesex Gas Company, Mill Hill; and what he said was rendered clearly understandable by members by samples of the different cards being handed round the room. He remarked that his Company had applied the card system in the following departments (in the order named): Prepayment gas-meters; maintenance; ordinary meters; work cards; and complaint cards. Prior to the introduction of the meter cards, the Company had books which, owing to the rapid growth of the district, were a source of trouble, inasmuch as it was impossible to keep the new roads (and, therefore, the consumers) in their proper sequence. With regard to the maintenance cards, he remarked that formerly the Company employed time-sheets. The cards were, however, introduced as being handier to file, and more durable; and, moreover, each card, when filled, constitutes a complete record of the work done and the materials used during 36 visits. Previous to the introduction of the work cards, also, the Company used time-sheets. But by adopting the card system, they secured a complete record of the cost of any job; and the cards, when filed away, were handy for reference. The complaint cards did not call for any special mention. In conclusion, Mr. Gale said he believed the system was in use by several other gas companies.

A good deal of interesting information regarding the system was elicited by questions put by the members. Mr. Liberty asked whether any difficulty had been found with the cards going astray. He presumed there was a cabinet in which they could be secured; but did they come back regularly from the outdoor men and fitters? Mr. Gale said they had not lost any cards up to the present. In the case of the work cards, the fitters had wallets, in which the cards were placed overnight. They were numbered; and so the Company knew how many were taken; and they had all to be brought back at night. The cards were made out from the work book, and then given to the fitters. Mr. Hewitt remarked that no doubt the system was very handy; but if a man had a job, and took a card with him, what record would the Company have should he unfortunately lose the card? Suppose some information was required in a short time with reference to a job that was being done, would the Company have to say: "We cannot tell you; the card is out?" Mr. Gale replied to this that they had a record in the books. Mr. Taylor said that for some purposes the card system was in use by the Tottenham and Edmonton Gas Company; and they employed quite 100,000 cards.

Mr. S. Carpenter, of the North Middlesex Gas Company, said he thought one great advantage of the system was the low cost of cards compared with books. The cost of cards for dealing with the records of meter-indices, would be 25 per cent. of what books would cost. Of course, this was an important consideration. With cards one could easily make distinctions for different classes of work by using various colours, which could not be done with books; and the Company found they saved a great deal of writing. With the old time-sheet system, if a man did not get through a particular job in one day, the whole of the information had to be set out again for the second day, and perhaps the third and fourth days; but with the card system, it was written out once on the card, and that card was kept in use until the job was finished.

Mr. Taylor pointed out that at Tottenham they had also stove cards. Each time a stove came in for repairs, the cost of the work was put down on the card; and if the stove was disconnected, this also was put down. Thus they had a record of the stove all through its life. There was only one card for each stove. Mr. Wright, also referring to Tottenham, said the cards were not taken out at all. The fitter did not carry the cards; he took out a work-sheet, and everything was put on the card when he returned. The Company had no cards for meter-reading; they were simply work cards.

Mr. Ainsworth inquired whether there was any difficulty in getting the fitters to put the figures into the small squares provided on the cards. Mr. Gale replied that the chief difficulty was with the work cards; but some of the fitters got the figures in very nicely. It was simply a question of becoming used to it. Mr. Ainsworth: Is it a system you could recommend for larger companies? Mr. Gale: I do not see why it should not work. Mr. Carpenter said that at Mill Hill the cards had actually been in use for twelve quarters now, and were in perfectly good condition. Of course, they were made up in packets and sealed. So far, there had never been a card lost. The men filled in the figures in pencil; and they were copied by a clerk in the proper space. Mr. Wheaton: Do you not think it is rather risky having the figures put down in pencil and then copied? Mr. Gale: Of course, there might be an error in the inking; but an average man going round with ink might make a mess of it. There have been a few mistakes. Mr. Pash: Does the consumer have any record of the indices taken? Mr. Gale: Yes; in the ordinary way. Mr. Taylor remarked that the system had been in operation at Tottenham for five years.

Referring to the cards used for ordinary meters, Mr. Gale said one card was made out for each house; and each card lasted four years. The cards were made up in packets of 100 or 120. A man could use the latter number in a compact district. The figures were put down in pencil, and subsequently inked in. The consumer's ordinary meter card was also marked in pencil.

SHOULD GAS-FIRES BE FITTED WITH ADJUSTABLE FLUES?

Mr. F. Ainsworth, of Ilford, then read a paper in which he advocated the use of adjustable flues with gas-fires, with outlets big enough to meet all requirements. This, he maintained, would largely give power to the consumer to regulate the heat and the draught according to circumstances; and thus it would prove a great boon to the users, and consequently of much assistance in increasing the sale of gas. Considerable improvements had been made in gas-fires; and during the last few years, there had also been much improvement in coal and coke fires, not to mention oil and other methods of heating. In new houses of respectable size, the sitting-rooms were fitted with adjustable canopies, so as to regulate the draught of the flue, as well as with an arrangement at the base of the fire-grate to control the air through the fire. In many houses now there was to be seen a gas-cooker in the kitchen, while a sitting-room fireplace was fitted with a high-pressure boiler to obtain hot water. There was an adjustable canopy which could be closed or open at will; and there was another damper or draught regulator fitted at the back, to which was fixed a rod, passing through the canopy, with a knob attached. Thus the flue belonging to the boiler could be opened to convey the heat round the boiler as needed; and there would also be an arrangement at the base to regulate the draught to the fire. All this was done to use solid fuel to the best advantage; and his own experience of such a system had been very satisfactory. Kitcheners were fitted with one or more dampers; and considering the many means which were being adopted to reduce the consumption of solid fuel, as well as in making substitutes for coal, anything that could possibly be done to reduce the consumption of gas in stoves and obtain the greatest efficiency, and at the same time to obviate the possibility of any fumes getting into the room, ought to be undertaken, if they were to make the progress they should do with the splendid means they had at their disposal.

What Mr. Ainsworth advocated was a self-contained fire, with a large radiating surface, and not with a canopy immediately over the fuel-guard, but well open, to allow the heat to radiate into the room, and fitted with an adjustable flue. The fire should be selected to suit the fireplace; but the flue should be made large enough to meet the maximum demand as well as the minimum required to deal with the products of combustion, and this could only be accomplished by using an adjustable flue. It was, of course, he said, a matter of great concern to know what to do for the best. It was all very well to say that the fitter ought to be made to do this and that, and not leave a fire until it was perfect; but it was not so easily done. They might train their fitters to adjust the burners and to fix the fire to perfection so far as appearance went; but when it came to draughts and ventilation, it was quite another matter. At the places where he had been, and was, employed, various methods had been suggested to try and overcome the difficulty of the chimney draught. To check the draught, they had fixed sheet iron into the main flue above the flue-pipe, reduced the flue-pipe, or fixed a cowl on the flue-pipe and reduced it as much as they deemed advisable; made up the fireplace, except the base, which was left for so-called ventilation; fitted a fire-brick leading into the gas-fire flue to lessen the orifice and obtain more heat radiation into the room; and they had made up the coal-fireplace altogether, allowing only the size of the gas-fire flue to pass into the main flue—except small openings which would naturally be left, as there was no packing to make the arrangement air-tight. But they failed to accomplish all that could be desired. In some cases the outlet had to be made so small that the next day the pull would not be sufficient. Where, however, they had had a fair-sized flue-outlet, and enough space between the stove and the sheet iron fitted into the fire-place to allow a damper or regulator to be fitted, so that the consumer could work it as desired, this had been done with considerable success. But what about flues where there was a difficulty in getting sufficient draught to carry away the products of combustion from a gas-fire? He considered that in this case they again had to resort to the fixing of sheet iron into the fireplace. He had found flues that would not work with coal without continually filling the room with smoke; and yet when a gas-fire had been fitted, the fireplace made up, and the gas-fire flue-pipe carried up some 6 or 8 feet or more, this had given satisfaction. They had all to admit that the coal-fire flue was far from perfect for carrying away the products of combustion from the gas-fire; but this was almost the only means they had, and so they wanted to find out how best to use it for the purpose.

In the course of the lengthy discussion on the paper read by

Mr. Stephenson, on "Gas-Fires," before the Midland Association in February, 1904, Mr. Cranmer, of Willenhall, pointed out that the products of combustion from a gas-fire were very much less in volume than those of a coal-fire; and therefore for the former the area of the chimney (he was speaking of the whole area) should really be less. In some offices he (Mr. Cranmer) had built, he had put into the walls flues 4½ inches square; and in his own office the gas-fire was sometimes burning night and day, but one could never tell without seeing it that there was a gas-fire in the room. The air was always as fresh as if the room had been heated by a coal-fire. Mr. Ainsworth said he also noticed that in the German rules and regulations for the fixing of heating-stoves it was stated that wide chimneys already existing should not be used as they were; narrow channels might sometimes be built up in them, or insulated metal tubes be introduced. As a rule, however, it was said, gas-heating appliances should be quite independent of the coal-fire chimney, and have their own chimney constructions; and it was well in many cases to recognize the necessity of building up a column of hollow brickwork on the face of the wall of the room. The exit-flue, it was added, should never be in a cold outer wall; but if it must be, it required to be insulated, and might be taken up inside the room, and only admitted to the chimney near the roof. It was recommended that the flues should be built in the chimney when the house was in course of construction; "but," said Mr. Ainsworth, "we should have to wait a long time for the builder to do this, or if the consumer had to pay for the work required. We should experience a difficulty in persuading them to allow a flue to go up inside the sitting-room wall." Thus there was a real difficulty to face in the best way possible; and he believed the adjustable flue would go a long way towards meeting the trouble. He used to get a large number of complaints of insufficient heat and feelings of unpleasantness; and he discovered that this occurred where sheet iron was not fitted into the fire-place, or only partly fitted. Where the fire-place had been open and the fire burning, though a fair current appeared to be going round the sides of the stove into the main flue, the fumes came out from under the gas-fire canopy and escaped into the room, which proved that they got not only the draught but the fumes as well. Only a few days previously, Mr. Ainsworth found a complaint in regard to two fires in some offices. In one instance, the fire was smelling, and, being cold, too much gas was being consumed. This, with a heating chamber, a small flue-outlet, and a somewhat faulty main flue, had given rise to the trouble. The other case was a fire with a direct outlet, and no sheet iron in the fireplace; and here the complaint was lack of heat. Another difficulty was in connection with a private dwelling, where there was sheet iron fitted, and the fire had a direct flue; but still they did not obtain enough heat. The lady said that if they stood in front of the fire, it appeared to give a good heat. No doubt by so doing the cold air was checked, and the radiation thus increased. The conclusion they must come to, argued Mr. Ainsworth, was that the flue was out of all proportion in dimensions for carrying away the products of combustion from the gas-fire, which might cause too strong a draught or the reverse. Was it not a fact that the tendency was for the draught to come into the room when the air in the main flue was cooled below that of the room itself, apart from many other causes? If so, did they not think when the fireplace was left open the products of combustion were cooled before they got far up into the flue, and though they did not get smoke, they got the products of combustion into the room, which gave rise to the complaint of unpleasant feeling? It was quite feasible that, by making up the fireplace, there was a better chance of warming the air and keeping the air-current upwards—at least, this was his experience. He had in many cases found also that fumes had got into a room because the gas-fire flue was too small, and would not carry away the products. This he would like to see obviated by enlarging the flue-outlet considerably, and fixing a regulating arrangement so as to have control of the chimney draughts.

In concluding his paper, Mr. Ainsworth pointed out that, in all modern houses, builders were compelled to put in ventilators in such a manner as to get a through current of air under the floor boards, in which there were generally openings to be found, as well as in skirtings, windows, and doors. Thus rooms were not without ventilation. He gave it clearly as his opinion that the flue-outlets of most fires for general use were too small, and ought to be made considerably larger, and fitted with adjustable flues. He asked how it was possible to deal with all variations with a fixed flue; and urged that many of the complaints they now had could, and would, be obviated if adjustable flues were fitted.

In reply to questions, Mr. Ainsworth said his idea was that the flue should be adjustable by the consumer. One hour there might be an up-draught, and another a down-draught; and the only thing was to have an adjustable flue which could be regulated as desired. In answer to an inquiry as to whether he suggested that the consumer or a servant should go every hour and alter the flue, he said they should choose the lesser of two evils.

Mr. H. Rothwell remarked that stoves had been made with adjustable dampers or moveable registers, which had proved a failure. They had to have too deep a fire. What was wanted was a fire that was absolutely "fool-proof;" and so far as gas was concerned, they had not yet reached this stage of perfection. If there was a moveable register, they had to trust to the person who had to deal with it, and not to the article itself. Consequently, it could not be perfection. Mr. Ainsworth said he should look upon what had been referred to, not as a flue damper, but as a fire damper. Mr. Rothwell replied that a fire damper must naturally control the flue. Local conditions governed the fixing of a gas-fire; and no matter how a fire was fixed in one room, the same thing under exactly the same conditions in another room might not be perfect. It was not a question of the flue or the stove, but of the experience of the fitter who fixed it. The flue was made just as big whatever fire was going to be used. This was where the evil came in which wanted remedying; and the only remedy to his mind was in the fixing of the stove, which was best left to the fitter or the foreman.

Mr. Ainsworth, referring to the remark that the adjustable dampers failed because they needed too great a depth of fire, said he thought the right place for the adjustable arrangement was in the flue itself. Some of the fires referred to were sent out fourteen years ago. They did good work, and were an improvement on the old fires; but the regulating must be done in the flue. He said the flue had never been tackled as it should have been. They wanted no heating chambers.

Mr. W. A. Barnett said he was strongly of the opinion that when once a person realized that he could tinker with an adjustable flue, he would always be doing so. He himself had one; and he was always finding that it had been interfered with. In his opinion if more time was taken to see that a stove was properly fitted up, even without an adjustable flue, it would be an improvement. Mr. S. Carpenter said that, while theoretically perhaps there was something to be urged for the adjustable flue, Mr. Ainsworth himself thoroughly condemned the idea, when he said that the draught of any particular chimney might possibly vary from hour to hour. If a consumer properly adjusted the flue and went away, and then when he returned found the fumes coming into the room or all the heat going up the chimney, he would soon get disgusted with the fire. Of course, in large houses the servants often had charge of gas-fires; and if they, having no real knowledge of the construction of the stoves, had to deal with the adjustable flues, there would often be trouble. Mr. Wheaton said he had some experience about ten years ago with adjustable flues and, in one or two instances, he found them very successful. All the conditions, however, were quite favourable; the draught being keen. A damper was fitted inside the flue, and a small outlet was left so that the flue could not be hermetically sealed at any time. It was done to please one consumer, who was well satisfied with the arrangement. Mr. Rothwell remarked that the modern stove manufacturers had come to the conclusion that the minimum gas consumption with the maximum amount of heat was what was required. In his experience the fault was not with the flue, but the amount of unconsumed gas that was pushed unnecessarily through the fuel. In reply to Mr. Liberty, Mr. Ainsworth said his Company only put in adjustable flues in necessary cases.

Mr. Smithers said he had got over the trouble without having recourse to adjustable flues. He had just looked into a complaint of heat going up the chimney, and had satisfied the consumer by simply backing-in the stoves with sheet iron and reducing the flue pipe from 3 to 2 inches. There was a fierce up-draught; and his experience was that if such a draught existed at all, it existed always. It was in the construction of the flue; and no outside draught would interfere with it. Mr. Ainsworth asked what objection there was to a flue that would give 2 inches opening at its minimum, and three times as much if it was wanted. Mr. Smithers: Because you have to deal with persons who do not understand the matter. Mr. Barnett and Mr. E. E. Grimwood pointed out that, in connection with reducing the flue, the height of the chimney would have to be taken into account. Mr. Rothwell said Mr. Ainsworth's method would mean the reconstruction of the stoves; and Mr. Ainsworth replied that he was referring to stoves that were going to be made. If they were to be successful with gas-fires, they must have the method that was adopted for other fuels. If it was good for coal, it was better for gas.

A vote of thanks was accorded to the readers of the papers.

Another Use for Natural Gas.—Our American contemporary, "Progressive Age," says: The gasholder of the Wheeling (West Virginia) municipal gas plant is said to be so full of holes that it leaks at the rate of 15,000 cubic feet per day. The gas-works management propose to add natural gas to the manufactured gas in the holder—claiming that since it is lighter it will rise to the top and leak out, and thus save the coal gas. The charge has been made that the works have been adding natural gas at 23 c. to their coal gas for some time, and selling it for 75 c.

The Gas-Price War in New York.—We learn from the "American Gaslight Journal" that Judge Hough, of the United States District Court, has submitted his opinion regarding the findings of the Master in Chancery (Mr. Masten), in respect of the New York Consolidated Gas Company's action against the authorities to have declared illegal the legislation directing that a rate in excess of 80 c. per 1000 cubic feet might not be charged. Judge Hough sustains the Master in his determinations on every main point involved. In effect his declarations are: That the 80 c. rate is confiscatory; that the two applying statutes taken together are unconstitutionally discriminatory; that the penalty clauses are oppressive to the point of being unconstitutional; and that the legislative power in the statute creating the Commission of Gas, Water, and Electricity was improperly and unlawfully delegated to that body. The case will be appealed to the United States Supreme Court.

MIDLAND JUNIOR GAS ASSOCIATION.

Visit to Stafford.

On Saturday afternoon, the members of the Association, to the number of forty or more, paid a visit to the Stafford Corporation Gas and Electricity Works, where a very enjoyable time was spent inspecting the plant. The tour was made in small parties under the guidance of the Engineer (Mr. Hubert Pooley) and Messrs. A. Poulson, T. Poulson, and S. T. Lea; assistance in explaining the electrical machinery being afforded also by Messrs. Meade and Robins. It may be remarked that the works are situated on the bank of the river, and have sidings connecting with both the London and North-Western and Great Northern railways; and from the few figures which were given by Mr. Pooley at the close of the visit (and which are reproduced below), it will be seen that the town has much cause to be satisfied with the undertakings and their management.

The gas-works have a maximum capacity of 2 million feet a day; and the coal gas portion was inspected first—beginning naturally with the retort-house, which contains three benches of horizontal retorts. Each bench consists of four beds, each of nine through ⌂ retorts, 20 feet long. A climb was made to the top of one of the benches to see the retort-house governor, with one of which each bench is fitted; and thereafter a visit was paid to the regenerative furnaces. The works have already been described in the "JOURNAL" (see Vol. LXXXIV., p. 282), so that it is unnecessary to again go into any detail. It may, however, be stated that the exhauster-house contains one Waller and one Donkin exhauster; while there are two sets of condensers—one atmospheric, the other water—and two scrubbers. The washer is by Messrs. C. & W. Walker, and is of a capacity of a million cubic feet per day. There are ten purifiers—six 25 ft. by 20 ft. by 6 ft. deep, and four 14 ft. by 10 ft. by 4 ft. deep; and purification is carried out almost entirely by oxide. There is also in use a naphthalene scrubber. Carburetted water gas is manufactured in a 500,000 cubic feet per day set of Messrs. Humphreys and Glasgow's apparatus.

The sulphate of ammonia house contains a plant by Messrs. C. & W. Walker (of a capacity of about 2 tons of sulphate per 24 hours), consisting of free and fixed stills, superheater, overhead liquor tank, acid tank, and pumps. In the boiler-house, there are two 250 H.P. Galloway boilers, each 7 ft. 6 in. diameter by 28 ft. long, and one set of Lowcock's economizers consisting of 72 tubes. The meter and governor house is a handsome building with pitch pine ceiling and walls covered with glazed tiles; and in it are a Parkinson and Cowan station meter of a capacity of 50,000 cubic feet per hour, two station governors, and a Pooley-Poulson patent carburettor. There are three gasholders—one of them spiral-guided—having a total capacity of 750,000 cubic feet. The gas is conveyed to the town through two 15-inch trunk mains. All material is weighed in and out of the works on a 40-ton Pooley patent weighbridge, with special relieving apparatus. The show-rooms contain an excellent assortment of the latest fittings and heating apparatus; and among other objects which excited interest were a Woodall and Moon mantle-testing machine, and a coal-testing plant to take one-thousandth of a ton—"home made" with the exception of the meter—the cast-iron retort of which can be heated up to about 1800° Fahr. by means of the gas furnace underneath.

The electric light works consist of three high-speed compound engines, each of 120 H.P., by Messrs. Marshall, Son, and Co.; two vertical high-speed compound engines, one of 250 H.P. and the other of 350 H.P., by Messrs. Willans and Robinson; three 300 H.P. Lancashire boilers, with a set of Green's economizers of 96 tubes; three rope-driven direct-current 66 kilowatt dynamos, by the Electric Construction Company, one 200 kilowatt dynamo, by Messrs. Thomas Parker and Co., and one 150 kilowatt dynamo by Messrs. Dick Kerr and Co.; two boosters; and one balancer, switchboard, &c. The accumulator house contains 214 cells.

At the conclusion of the inspection, the members assembled in the meter and governor house, where Mr. Pooley said he should like to tell them how pleased he was to see them there. It afforded him the greatest satisfaction that the Association should favour his works with a visit; and he hoped they had derived some benefit from the inspection. He had with him a table relating to the gas and electricity undertakings which he had submitted to the Senior Association last year, but which had now been brought up to date. This gave the whole of the details of the working. The best result they had so far had at Stafford in gas sold per ton of coal—and he took it that this was the real criterion, because it embodied the whole of the operations, not only on the works, but in the distribution department as well—was 11,444 cubic feet in 1906. But as in some quarters they did not quite give satisfaction, his Committee decided to reduce the make. This was accordingly done last year, when the gas sold per ton of coal carbonized was lowered to 11,052 cubic feet. The makes per ton for the last two years were 11,824 and 11,423 cubic feet respectively; the percentages of unaccounted-for gas having been 2 and 2·06. It was natural to expect that, if one got such a very high yield of gas, it would not be possible to sell quite so much coke; and the coke sales at Stafford only averaged about 9¼ cwt. per ton of coal carbonized. With regard to sulphate of ammonia, their effluent never exceeded 0·004 per cent. of ammonia. It would average about 0·003 per cent.; and they frequently got as low as 0·001 per cent. They used a Walker plant with certain modifications; and they had a centrifugal dryer, and a special sulphate store. With reference to the price of residuals at present, except for coke he thought that the markets were in a dreadful state. Tar seemed to be right down at the bottom; and they had almost reached the point at which it would be satisfactory to burn it rather than sell it. The sulphate market, too, was in a most difficult position at present, for the seller. With regard to purification, the costs at Stafford were low; and in the year 1907 they made their record of 0·05d. per 1000 cubic feet. The carbonizing wages (and the members would have observed that there was very little machinery about the works) were lowest for the year 1906, when the figure was 1·68d. per 1000 cubic feet. The carbonizing costs included most of the coal in and most of the coke out; the wheelers being encouraged to load the waggons rather than to put into stock—and this they did because they saw the value of it to themselves in the bonus. [There is, of course, a profit-sharing scheme in operation at Stafford.] There were also included all stokers' wages, and the night man who attended to the engines. In 1907, the figure was 1·78d. per 1000 cubic feet; and since then up to date, the carbonizing wages were 1·8d. They were also rather proud of their small proportion of bad debts, which was an important feature. Their total collections in the gas and electricity departments last year amounted to about £41,000; and of this the bad debts amounted to something less than £72. This was very low. Certainly, it was not the lowest in the country; but it was low enough for him. In the last two years, the law costs had been *nil*. Last year, the cost of coal and working expenses, less residuals, was 11·38d. per 1000 cubic feet. With regard to the electric light undertaking, he took charge of this in 1900; and at that time 118,000 units per annum were being generated, and 86,000 units were being sold. Last year they made 368,000 units, and sold 307,000 units. The revenue from sale of current was 4·6d. per unit sold during 1900, and 2·96d. for last year. The cost of generation—which were generally termed works costs—amounted in 1900 to 1·69d. per unit; while for 1907 the figure was 0·96d. per unit. The total costs, including distribution, a small amount of office expenses charged against the electricity works, rates and taxes, &c., were in 1900 2·72d. per unit sold and last year 1·18d. Speaking broadly, the output of electricity had been quadrupled in his time; the costs had been reduced by 60 per cent.; the price to the consumer had been reduced rather over one-third; and the profits had been increased four-fold. In conclusion, he asked the members to go and have tea with him at the Café Royal.

This was an invitation which was accepted with pleasure; and at the conclusion of the meal, the President (Mr. W. E. Caton, of Derby), in acknowledging the very kind way in which they had been received by Mr. Pooley and his staff, remarked that one did not require to go round the Stafford works twice to notice the capable way in which everything was managed—reflecting very much credit on Mr. Pooley. The visit had been a most interesting one to him personally, partly on account of the fact that his chief (Mr. J. Ferguson Bell) held Mr. Pooley's present position at Stafford some six or seven years ago. He had great pleasure in proposing a very hearty vote of thanks to Mr. Pooley, and he would also like to couple the names of his assistants, who had given up an afternoon to show the members round the works. Mr. A. N. Comely (Birmingham), in seconding the motion, said he was sure he was speaking for all when he assured Mr. Pooley that they had spent a most interesting afternoon. Especially did they appreciate the opportunity of seeing the electric lighting works. Most of them were associated only with gas-works, and to see an electricity station, generating their rival lighting and power agent, was an interesting event.

The vote was carried with acclamation; and Mr. Pooley, in reply, expressed his appreciation of what had been said. He assured them that he and his assistants had been delighted to have the opportunity that day of showing the members round their works, and he also had been happy to have the privilege of having them to tea with him that evening. It had only been a great pleasure to them at Stafford to see the members; and they did not at all consider they had lost any holiday by it. They were all of them in Stafford in love with their profession. He would like to say that just now, in the face of the keen competition which they had to experience, they must all of them fight, and fight hard, the whole time. It was a case of struggling; but it was his conviction that victory would be theirs. As a profession, they were in front at the present time; and they were going to remain there.

The many friends of Mr. John Watson, the Manager of the Milton-next-Sittingbourne Gas-Works, will regret to learn that he has just sustained a sad bereavement by the death of his young wife. Mrs. Watson had a serious illness last August; but she recovered, and enjoyed her usual health until some time before Christmas, when she had a relapse. An operation was found to be necessary, and for this she was removed from her residence to St. Bartholomew's Hospital, Rochester, where it was successfully performed; but the unfortunate patient succumbed to it. Mr. Watson, for whom great sympathy is felt in Milton, is a son of Mr. S. Watson, of the British Gas Company's Tunstall station. He is left with a little girl two years of age.

SCOTTISH JUNIOR GAS ASSOCIATION.

WESTERN DISTRICT.

A Monthly Meeting of this Association was held in the Technical College, Glasgow, on Saturday evening—the President, Mr. W. Wilson, of Falkirk—in the chair.

Presentation to the Hon. Secretary.

The President said he had a very pleasing duty to perform, in the presentation to the Hon. Secretary (Mr. G. Braidwood) of some technical books, as a token of the respect they had for him, after being Secretary of the Association for the past few years. Mr. Braidwood had been very wise in his selection; and he had much pleasure in asking his acceptance of the gift.

Mr. Braidwood, in returning thanks, said that when he was appointed to the office three years ago, he entered on the duties with fear and trembling; but he found that the work, instead of being laborious, was a pleasure. Mr. Mason handed over the books to him in excellent order; and he found everything to be plain sailing. Since his appointment, he had made many friends. When approached with regard to the nature of the gift, he quite thought he could not do better than ask for a number of standard works on gas manufacture. These books would always be beside him; and they would keep him in mind of the many friends he had made during his secretaryship.

COMMENTS AND SUGGESTIONS ON ADVERTISING.

Mr. William M. Mason (Glasgow) read a paper on this subject, in the course of which he said:

On an examination of the papers which have been read before our Association since its inauguration, it will be found that the great majority deal with purely technical matters, and only a very few touch on the commercial side of our business. It may, therefore, not be out of place to call the attention of our members—many of whom are, or should be, deeply interested in the selling side of our business—to something which is more vitally associated with the success of any undertaking, large or small, and which I make bold to assert does not receive the attention of the gas profession in any proper degree. There are two outstanding features in advertising of any kind. The first is that of making the public think they need something that you may have for disposal; and the other is the proper and legitimate one of having something to sell which you are firmly convinced is a good thing, and will prove beneficial to the purchaser. The aim and object of all advertising is, of course, to sell something; and if this object be not accomplished, it has failed in its mission. It should, therefore, not be a difficult matter to determine, after a fair trial, if "the game is worth the candle"—to make, in fact, the "proof o' the pudding the preein' o't."

One of the main objections to advertising on a large scale is the expense that must be faced; most men, whether in company or corporation, believing strongly in the old adage that we should "never cast our bread upon the waters unless the tide is coming in." It would be received with incredulity if the fact were stated to some of these would-be economizers, that certain world-famed firms spend fortunes in a year in this way, and that such men state that their businesses absolutely depend upon this seeming extravagance. Another objection is, I believe (at any rate as far as some corporations are concerned), the fear of having the sworn enemies of municipal trading on their track. This bogie, which is certainly not getting less assertive, should, in the speaker's opinion, be boldly faced and defied.

The fatal error which is really at the foundation of most of this trading trouble is, however, the erroneous standpoint from which many look at the matter. The usual bald statement of the case is that it is not right for any corporation to come into direct competition with, and cut the feet from, ratepayers by underselling them and disposing of goods at a loss. Now, such a state of affairs would most certainly not be right; but this is just one of the points which has been so often thrashed out. The corporations, as has been repeatedly proved, do not sell goods at a loss, but charge a very fair percentage on list prices. This is, at any rate, the rule in the two largest undertakings in Scotland.

The matter of municipal trading should, however, be looked at from a much more important standpoint—viz., that of public convenience. The trader has undoubtedly his rights, which he is wise to protect; but has a corporation or a company no duty with regard to the great body of their consumers? Are the interests of the many to be sacrificed for the benefit of the few? We do not need to be advanced Socialists to say most emphatically that the gas suppliers, as trustees for the consumers, are entitled—nay, are compelled—to devise means for giving such consumers the benefit of economies they can devise in any direction, and of letting customers reap the fruit of their business methods.

This is surely just where advertising becomes not something to be treated with indifference or contempt, but a legitimate means of bringing to the notice of consumers the best and most up-to-date appliances for lighting, heating, and cooking. If the matter of enlightening the public as to the best methods of lighting and heating be left solely to the ironmongers and plumbers, as they would like it to be, it is to be feared that, unless things change quickly, little progress will be made, as, while a few firms are undoubtedly striving to do all in their power to bring before the public the class of business we are specially interested in, the majority are contented with the "dog-in-the-manger" policy of growling. In this connection, a rather remarkable fact was brought to light at the inquiry in Edinburgh some time since, when it was found that 16 of the 41 plumbers and ironmongers who signed the petition against trading by the Gas Commissioners had their shops lighted by electricity; while 12 of them had no indication whatever that they traded in gas apparatus, and only 16 of the number exhibited gas fires and cooking appliances.

While the working arrangement entered into between many of the large undertakings and the Ironmongers' Associations, on the lines of the agreement made by the Gaslight and Coke Company, should tend to bring the hitherto opposing camps more into harmony, it would be a fatal error if gas undertakings were now to rest on their oars and cease striving, in every way possible, to create and stimulate a demand for their principal product. What cooking would have been done by gas if the corporations had not let out appliances on hire? How many people would be prepared to buy cookers and stoves, compared with the number willing to hire? No trader would lend goods, and so the corporations had to do it; and their doing it has been the salvation of their business, and the means of getting back a consumption they otherwise would not have secured.

It has often been stated that the incandescent mantle has saved the gas industry. This is no doubt true from the lighting point of view; but it ought also to be remembered that the actual gas consumed is, by means of the mantle, considerably reduced. It is thus apparent that, if this reduction is to be made good, and the consumption still to go on increasing, "pastures new" must be developed. This is exactly where the importance of the stove and fire business comes in; and therefore it is this tremendous field that is the most hopeful one for the advertiser. Some indication of the importance and urgency of this matter may be found in the statement of a simple fact such as this—viz., that in Glasgow and the district within the area of supply there are approximately 250,000 inhabited houses, while the stoves and grillers on hire number only about 40,000. A form of advertising which is commending itself in this connection is that of supplying and fitting stoves and grillers free of charge; it having been proved that the profit made from the sale of gas used in these appliances more than pays all the expenses of installation.

The question of canvassing by inspectors and collectors raises a very debatable point, and one on which there may be great difference of opinion. There is absolutely no doubt that the man who is coming into direct contact with the consumers at least four times a year has by far the best chance of not only removing prejudice and giving enlightenment on the correct methods of using gas, but has also the best opportunities of suggesting new appliances for an extension of the use of gas. It stands to reason that the "gas man," as he is familiarly called, who is already known to the customer, and who, as a rule, gets a friendly welcome, can do far more to influence such customer with reference (say) to the advisability of using a gas fire or cooker, &c., than the canvasser pure and simple, who will probably have difficulty in even getting a hearing.

The question of commission on real orders obtained could, I am sure, with a little thought, be easily arranged, and would not only be a means of stimulating the employee to greater effort, but would be a source of encouragement, as it would prove in a practical manner that those in authority could appreciate good and faithful service. Such a system is, I understand, at present in operation with marked success in some of the large London Companies; and it might, I am sure, be adopted with advantage by both large and small undertakings nearer home.

Much has already been done by the Glasgow Gas Department in the matter of public exhibitions, given at various places in the area of supply with the best results. At these exhibitions many up-to-date lighting and heating appliances are shown and explained; but the principal features have been demonstrations in cookery and laundry work by fully qualified lady teachers, and the practical results for the department have been evident in the increased sale and hire of cookers, &c., with the necessary accompanying increase in the use of gas. There is still, I think, room for developing this line of business, as well as that of cookery demonstrations in private houses. That good results are obtained from the practical demonstration side of advertising may be proved in other directions besides those already referred to. A telling case in point was that of the lighting of the Glasgow City Hall. Attention having been drawn to the old-fashioned flat-flame sunlight in the roof, the matter was carefully considered, and, after many experiments, the contrivance now known as the "incandescent sunlight" was evolved, which has been the means of effecting a marked improvement in the illumination, and of making this popular meeting-place one of the finest-lighted halls in the city. The matter does not stop there, however, for very soon the authorities having to do with public halls, churches, &c., become dissatisfied, make inquiries, discover to their amazement that the new and brilliant illumination is actually costing less than the old arrangement, and they naturally arrange to have a similar change made as soon as possible.

Again, some time ago our General Manager's attention was drawn to what was being done in other cities in regard to the lighting of cathedrals and churches; and he succeeded in getting those who had charge of the lighting of Glasgow Cathedral to allow experiments to be made with the incandescent gas system, with the result that the highest satisfaction was given, and the

whole of the Cathedral is now brilliantly illuminated by means of gas. The great change brought about at this important place of worship proved at once an admirable advertisement, with the result that now about 24 churches and 10 halls, all over the area of supply, have followed suit, and are benefiting, both as regards cost and efficiency, by the change; while it goes without saying that the Gas Department are not losing in the matter. Or, again, take the case of the School Boards. After some considerable negotiation, it was agreed that our department should fit up a class-room in one of the schools belonging to the Glasgow School Board. When everything was properly adjusted, the Committee of the Board having the matter in hand were invited to a demonstration. They were shown the improvement brought about by the new arrangement, and also, by means of a test meter specially connected for the occasion, the actual quantity of gas being used, so that they might, by a simple calculation, see at a glance the economy effected. The argument was so powerful that several of the largest schools under the Board, in which it had been decided to instal electricity, were at once lit by the better and cheaper method. Some 25 schools under the Glasgow School Board are now lit by incandescent gas, and other Boards in the district are following this excellent lead. The most interesting part of this side of the subject—viz., how a good thing advertises itself—cannot be better closed than with a reference to the development and demand for radiators. These most useful articles, embodying as they do compactness and neatness, have proved a veritable blessing to many a distressed hallkeeper who has been nearly distracted by complaints as to cold and draughts. Radiators were tried as an experiment in St. Andrew's Halls, where there are now nearly 50 in use; and they have since been adopted with success in many halls, churches, and shops.

While there is not the slightest doubt that the facts of a good and economical service are the best advertisements, it still stands to reason that many points of vital interest to our industry can only be brought to the notice of the public by means of freely circulated literature. It is, however, not sufficient to merely sow it broadcast; it should be followed up by canvassers, and should be only a means of opening the door for future business. These methods were used in specially defined districts in the Glasgow area, and the results were most satisfactory.

The question of flash-light signs is another of the many points which might be further discussed; but, in this connection, I shall only pass on a suggestion recently made—that distinctive signs might be adopted by various trades and professions; these signs to act distinctly at night, by means of different coloured globes, in the same manner as doctors' lamps show at present. The adoption of such means of distinguishing various classes of businesses would, as an advertisement, have many and very apparent advantages.

I trust something has been said to show what an extensive and interesting subject I have been trying to deal with. I do not for a moment claim to have said the last word on it, but have only endeavoured to offer a few suggestions that might prove of practical value to us all. Allow me in a word to emphasize them: (1) The hopeful outlook for stoves and fires, and the need for push in dealing with them; (2) the need of forceful energy as regards canvassing; (3) the importance of lecturing and practical demonstrations by the chief and his staff; (4) the systematic use of crisp, true, and telling literature.

Discussion.

Mr. A. Wilson (Glasgow) rose to open the discussion, for two reasons. He wished to say how much he was indebted to Mr. Mason for his paper, which was well put together, and brought a number of points before them very clearly. Then he had come there to get the views of those who belonged to their own department, as well as those belonging to other departments. A paper such as this was well worth considering. As Mr. Mason had pointed out, they had had a great many technical papers, which had been well discussed; but it was not easy to make good gas, or good gas cheaper, unless they could sell it well. The more gas they could sell, the lower would be the price at which they could afford to sell it. Though they might themselves be pretty well up-to-date, he did not think the general public quite recognized the benefits which were to be secured from the use of gas. There was not nearly enough advertising done. He was quite at one with Mr. Mason in this respect. They should endeavour to bring the people to a knowledge of the benefits to be got from the use of gas—the using of it largely and economically. In the old days, it was considered that it really did not matter whether the people took gas or not, because they could not go anywhere else. All this was changed now—changed both for the benefit of the public and for that of the gas department. Competition had sharpened them all up. He did not quite agree with what Mr. Mason said about the plumbers and ironmongers. He thought the best policy was to conciliate them as far as possible, if they could get them to work with them, because there was no doubt that the more labourers there were, the more work would be done; and while they did not slacken their own efforts, if they could get the plumbers and ironmongers to work along with them, the results would be better than if they defied them, and did not have their assistance. He was thoroughly convinced that there was an immense field open for all gas companies and gas corporations, and all plumbers and ironmongers. There was a large amount of work lying ready to their hands everywhere, if they could only get the public along with them. He was very glad to say that the arrangement they had made with the plumbers and ironmongers seemed to be quite satisfactory to them, as they had thanked them for it. He was certain it would be a benefit, both to the gas department and to the plumbers and ironmongers, and also (which was of more importance) greatly to the benefit of consumers.

Mr. S. B. Langlands (Glasgow) considered that the question of the ironmongers was a big one. What he objected to in ironmongers was their lack of knowledge. They simply did not know anything about gas appliances. They would give a "C" mantle for a No. 3 Kern burner. Then, unless they stood over them, to see that they put in the best material, they would not do it. He knew of a case where they put in governors of such a type that the light struck-back and the core was melted. They had got to meet things like this. Perhaps the first thing to be done was to educate these people; but they had a big job before them in this, because they would always sell the cheapest article in the market. He would commend Sir George Livesey's suggestion of co-operation. Surely they could give their collectors and inspectors some commission on their work. It was done in other departments of the Corporation. The main point in canvassing was not to issue a booklet and do nothing more. They must go back, again and again. In Glasgow, the idea was to send a book out three days ahead of the caller. The Corporation were content with a profit of 25 per cent.; but some traders took as much as 200 per cent. He thought the Corporation should be allowed to go into honest competition with all parties.

Mr. A. H. Whitelaw (Glasgow) remarked that Mr. Mason said there were 250,000 inhabited houses in the Glasgow district, and only 40,000 houses in which there were stoves or grillers on hire. He thought Mr. Mason must have made a mistake with his figures. In a district he knew there were 50 houses; and in every one of them there was a gas stove or griller. He could not think there were only 16 per cent. of the houses in Glasgow in which there were gas stoves and grillers, because undoubtedly they were a boon in a house. They saved a great deal in time and worry, and they were very clean, and besides this they effected a saving in coal. He did not think there was so much call for advertising as for canvassing. If there were only 16 per cent. of the houses in Glasgow with cookers or grillers, there was room for canvassing.

Mr. A. Smith (Tradeston) was convinced that, on account of the competition existing, advertising must be attended to. The solution of the smoke problem was mentioned; but the public must be informed as to what the cost would be if they were to do away with their coal-ranges. The majority of people did not go to exhibitions or lectures, nor did they hear anything about them. Therefore it was desirable that they be canvassed. As to lighting, he suggested that they should have a system of high-pressure lighting in the central district of Glasgow, such as was to be seen in London and on the Continent. The hiring of gas-fires was a subject which required a good deal of consideration, because the first cost of them was high; and he did not know how they would be received by the public. Consumers required to be educated to the use of gas.

Mr. J. Simpson (Glasgow) entirely agreed that they should advertise the commodity with which they were all connected; and he believed the lectures which their chief in Glasgow had delivered had done perhaps more than some might think to bring the department before the people. They should act as gas missionaries. Wherever they went, they should preach gas.

Mr. J. MacLeod (Kirkintilloch) said the paper was so full, and had so crystallized a lot of hazy notions of his own, that he felt indebted to Mr. Mason for having put the matter so clearly before him. It would stimulate him to further efforts in the pushing of the sale of gas. That advertising would be an immense benefit to them could not be doubted. They must conduct the gas business in the same way as any other undertaking, and see that advertising was attended to.

The President approved of canvassing by the collectors and surveyors, or by a paid servant of the undertaking. He did not believe very much in allowing manufacturers to canvass. In a case of which he knew, where it was allowed, about twenty cookers were returned by the people, and were left on the hands of the gas company. They were bogus orders which had been taken. It was a very good suggestion that canvassers should get commission on what they sold. The general body of the ratepayers, who, under corporation management, were the owners of the gas concern, did not take advantage of their property as they ought to do. If they did so, by putting in gas cookers and fires, they would be able to get gas at about half as much as they were paying for it. There was no doubt gas would be much more extensively used in future. That the public did not take more advantage of gas was, he thought, because gas undertakings did not advertise in the way Mr. Mason had been rubbing into them. There was another thing which might be mentioned. Many gas-works were old and under-staffed; and the manager found it took all his time to attend to the gas supply, and that he had none to spare for outside work. Gas managers very often had not time to exercise their powers for extending business as they might. He moved a vote of thanks to Mr. Mason for the way he had put the subject before them.

Mr. Mason, returning thanks for the vote, said he would have gone into the subject of smoke abatement, but his paper was long enough without it; and it would form an excellent subject for a contribution by someone else. As to the figures which

Mr. Whitelaw questioned, he got the number of inhabited houses from a report submitted to the Corporation; and he thought the figure was a very low one.

Mr. WHITELAW pointed out that, in addition to the gas appliances on hire, there were probably 30,000 which had been purchased by consumers.

TRAFFIC MANAGEMENT IN GAS-WORKS.

Mr. W. STRAITON, of Provan, read a paper on this subject. He began by saying that he proposed to deal with railway traffic, and particularly with the traffic to and from the most modern of gas-works—those at Provan. Having given a description of how traffic is brought in and sent out from the works, he went on to say: At the Provan Gas-Works, traffic is received and dispatched daily by the three principal Railway Companies. The Caledonian Company deliver their traffic into the works' high-level sidings from Germiston Junction, and accept their outgoing traffic at Blackhill Junction on the low level; the North British Company deliver and accept their traffic at the high-level sidings working through a branch line from Garngad Station; the Glasgow and South-Western Company, having running powers to Garngad Station only, their traffic is worked up the branch by the North British Company, for which service they are paid a way-leave. During the daytime, the Corporation have three locomotives employed—one on the high-level working the received traffic, one on the low-level working the forwarding traffic, and one attending to the chemical works and assisting the other two as required. All interested in the manufacture of gas are aware that the best results are obtained from a judicious mixing of the different kinds of coal—splint, whole seam, Virtuewell, ell, coking, cannel, &c. It is therefore the duty of the party in charge, before giving orders to the shunters, to go through the sidings the first thing in the morning and ascertain the number of waggons of coal on hand, and the different kinds. He then instructs the shunter what sidings to lift from, the quantity of coal to tip, and how to dispose of any other traffic that may have arrived—such as bricks, retorts, fire-clay, iron, stores, &c.

As most of you are aware, at Provan the waggons are put on to a cradle, and the coal tipped into a hopper by means of hydraulic power. It is therefore necessary that the end doors of all the waggons should open the one way—namely, next the hopper. The shunter then goes to the sidings and lifts a train, which may be anything from 14 to 22 waggons, according to the power of the locomotive, shunts the waggons with the end doors the right way into one siding, and those with the doors the wrong way into another, catches both lots on to his engine, and goes to the weighbridge and gets his train checked and weighed. Waggons with the doors the wrong way are then put into this siding, and those with the doors the right way are separated into the sheds leading to the hoppers, according to the class of coal they contain. Those with the doors wrong are next turned and similarly dealt with. The coal having been tipped, the empty waggons are collected together and taken to the weighbridge, where they are tared. All plain Railway Companies' waggons are shunted out and kept to be loaded with outgoing traffic; the traders' or coal-masters' waggons being separated, and put into the Railway Companies' sidings from which they were received. The same procedure is gone through throughout the day by the men on the high level, with an occasional break to attend the lime-kilns. The limestone is weighed, checked, and run to the top of the kiln as required; the empty waggons having first been removed and dealt with, the same as those received with coal. Owing to the position of the lime-store and the bottom or eye of the lime-kilns, in working the lime shells from the kilns to the lime-store there is a minimum amount of work, which takes a maximum of time to perform; the loaded waggons having to be drawn from the bottom of the kiln, run by or past the engine into another siding, and then propelled into the lime-store, the empty waggons being dealt with *vice versâ*.

All traffic is weighed and checked while the train is in slow motion. After the empty waggons have been tared, the tare of the waggon and the net weight of the coal carbonized are entered in another book, which is sent to the office every morning for the Manager's report, and to be checked with the senders' invoices. Separate books are kept for entering the particulars of limestone and miscellaneous traffic received, which are sent to the office at the end of each month to be checked. The work of the engine and men on the low level will be best explained by dividing it into three—morning, forenoon, and afternoon. Starting with the afternoon, all orders for coke, lime, &c., are received at the weigh-bridge from the office at midday, from which a programme is written for the shunter in charge, showing the number of waggons of coke, riddled breeze, fine breeze, shale, ashes, lime, &c., to be despatched by the different Railway Companies. All empty waggons kept on the high level or received from the Railway Companies are run to the low level. All loaded waggons are then shunted out from the coke and breeze shoot sidings, and the empty waggons are marshalled in accordance with the programme drawn up—Glasgow and South Western waggons next the engine, North British next, and Caledonian last; those for coke, riddled breeze, fine breeze, and unriddled coke being set at different shoots. These shoots are attended to during the night by the night-shift engine. In the morning, the traffic for the different Railway Companies is separated and taken to the weighbridge, where the shunter informs the weigher which Company's traffic is on his train, and the contents of each waggon in rotation.

When the orders for out-going traffic are received from the office, the weigher writes out two tickets or labels for each waggon (except for shipping traffic or full train loads, when one label suffices), which he puts on to the waggons after they have been weighed. He then enters in a book, which is sent to the office, a description of the traffic, the waggon number, gross weight, waggon tare, net weight, name and address of the consignee, and whether the carriage is paid or to pay. The weigher also writes out a consignment note for each Railway Company, giving most of these particulars—the net weight only being given. During the night time, one engine and two men are employed tipping coal and attending to the coke-shoots and boilers. Neither of the Railway Companies having access to the chemical works in connection with the Provan Gas-Works, all Messrs. Brotherton's traffic is shunted, marshalled, weighed, delivered and despatched by the Corporation, and may be said to occupy about one-third of the time of one engine and men.

It is an apt saying, and one frequently used in argument, that figures can be made to prove anything. This notwithstanding, I venture, in concluding my paper, to give a few which to those interested will, I hope, be valuable as a comparison. During the month of December last, when supplies were full, we took delivery of, on an average, daily 125 waggons of coal, 17 waggons of limestone, lime shells, miscellaneous, and Messrs. Brotherton and Co.'s traffic; and dispatched by rail 71 waggons of coke, breeze, waste, lime, ashes, pitch, oil, &c., and put into the boilers, kilns, and cart road 21 waggons of fuel. This gives a total of 234 waggons, which, multiplied by 2, as each loaded waggon represents an empty, shows a total of 468 waggons handled in a working day of 9½ hours by three locomotives and a staff of 11 men—three drivers, five shunters, two weighers, and a foreman.

Discussion.

Mr. S. B. LANGLANDS said he had enjoyed Mr. Straiton's paper very much. Anyone who had come into contact with large works, knew the incessant worry there was in the matter of coal delivery. Mr. Straiton said that all waggons were weighed in motion. Did he think that correct weight could be obtained of a waggon in motion? At Dumbarton, years ago, he weighed waggons standing, and got a considerable difference from the weight when in motion. Did Mr. Straiton accept the tares upon the waggons?

Mr. A. SMITH said the subject was one he was very much interested in at Tradeston, and particularly at the present time. Regarding tares, he would like to draw the attention of those who had anything to do with traffic to the fact that there was a great difference between the weights which were painted upon the waggons and those actually found. They used to accept the painted figures as being correct; but they discovered that they were making a huge mistake. The difficulty of getting empty waggons from the railway companies seemed to be troubling everyone just now. The trouble was to get sufficient empty waggons to take out the coke. He had learned that traders' waggons were being offered to gas-works, in preference to sending them to the docks for shipping, because it was known that if traders' waggons were sent to gas-works they would be returned to the pits more speedily; and the railway companies sent their own waggons to the docks, where they could be used for incoming traffic.

Mr. J. M'LEOD (Kirkintilloch) agreed that the traffic management of a big concern was a department in which much profit could be earned, in the thinking out of how to place the waggons, and to marshal them, so as to require the minimum amount of work.

The PRESIDENT said the question of the handling of traffic had been brought before his own mind recently, because the Corporation he served had been forced by the railway companies to procure a locomotive for use within the gas-works. He proposed a hearty vote of thanks to Mr. Straiton.

Mr. STRAITON said that weighing waggons in motion depended upon the position of the weighs, and how the permanent way led into them. If the road were level, they could weigh as accurately in motion as when standing; and if there were much traffic to handle, they would never get through it if every waggon had to be brought to a standstill. At Provan, they tared all their empty waggons; and he had got as high as 12 cwt. difference. The weight fluctuated according to the weather. In wet weather, a waggon certainly weighed heavier than the mentioned tare. Their position at Provan was not better by their having two railways; for they had great difficulty in getting waggons. He thanked the members for their kind remarks.

The PRESIDENT intimated that their next event would be a visit to the Tradeston Gas-Works, on the 25th inst

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A short time ago, the Governors of the Heriot-Watt College, Edinburgh, decided to appoint Advisory Committees in connection with the various subjects taught in the College, with the view of stimulating interest in the classes. The Committee on Chemistry was to consist, in addition to two members of the governing body, of a representative from various local Associations, including the Gas Commission; and Mr. W. R. Herring, the Chief Gas Engineer, was asked if he would consent to serve on the Committee for three years from the 1st inst. He at once expressed his willingness to do so; and said he had no doubt the Commissioners would not raise any objection to his filling such an office.

REGISTER OF PATENTS.

Coin-Freed Gas-Meters.

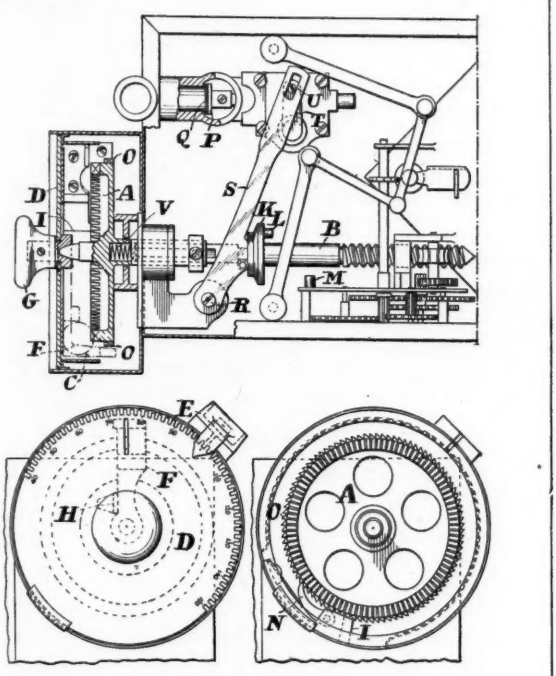
GAS METER COMPANY, LIMITED, and GOW, J., of Kingsland Road, N.E.

No. 29,205; Dec. 21, 1906.

This invention relates to coin-freed gas-meters in which the coin-receiving mechanism actuates a traversing screw gearing into a worm wheel actuated by the meter-index mechanism, and in which the gas-valve is opened and closed by a lever actuated by the traversing screw. The object aimed at is to provide a stop that will prevent further rotation of the traversing screw when at the end of the traverse. When the maximum amount of gas is prepaid, the coin remains in the coin-receiving mechanism; but the mechanism cannot be actuated until the stop is removed. The traversing screw, when returning to its initial position, compresses a helical spring that, on the insertion of the next coin, helps to open the valve. The spring also takes up back-lash.

The stop on the traversing screw consists of a pin or projection on a plate made in one with, or fixed on, the traversing screw.

The shut-off valve is a horizontal cylindrical valve with a cushion face pressing on the knife edge seat, and is operated by a slotted arm on a vertical axis having another arm operated by the lever from the traversing screw.



Gow's Coin-Freed Gas-Meter.

The toothed coin-wheel A is slidably fixed on one end of the traversing screw B, and is adapted to engage directly by means of teeth with the coin C. A notched indicating disc D, provided with a fixed coin-slot, is arranged coaxially in front of the wheel A, and is fixed in any desired position by a bracket E, screwed to the body of the meter and engaging in one of the slots in the disc. A coin-pocket F is arranged on the inside of the disc, and can be turned by the handle G into a position in engagement with the stop H fixed on the disc, when it will register with the coin-slot—its movement being limited when operating the meter mechanism by a fixed stop I.

To the side of a plate K, arranged on the traversing screw B, a stop or pin is fixed, which, when the screw has been operated by the insertion of coins in the meter to the predetermined extent, comes into engagement with a pin or projection M on the body of the meter, and prevents its further rotation. Should a coin be still in the receiving mechanism when the screw has been arrested in its movement, the coin will be locked in the mechanism till sufficient gas has been consumed to cause the disengagement of the stops L and M through the return of the traversing screw—its backward movement being prevented by a pawl N taking into the teeth O on the wheel A.

The shut-off valve P pressing on the knife-edge seat Q is operated from the traversing screw B by means of a lever S fulcrumed at R by a slotted arm (not shown) fixed on the same axis with the arm T—the pin U on the arm T engaging in a slot in the extremity of the lever. A spring V is arranged in the hollow sleeve of the wheel A and presses on the end of the traversing screw.

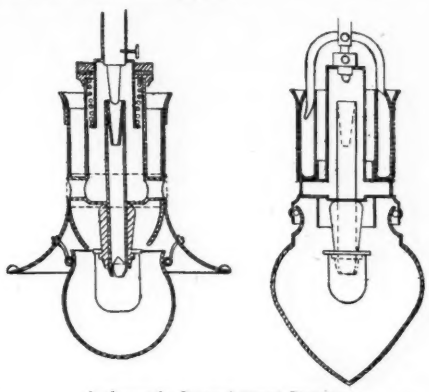
Inverted Incandescent Burners.

ANDERSON, W. & H., of Edinburgh.

No. 4112; Feb. 19, 1907.

This invention has for its objects to increase the pressure of the air and the gas, to cause the gas and the air to mix more perfectly together before combustion, and to decrease the vibration on the mantle.

As shown in the two forms of lamp illustrated, the pressure of the air is increased by heating it in a chamber above the burner, into which pipes conduct air through the gallery. The upper portion of the chamber consists of a vertical tube which can be screwed up or down—made longer or shorter. The pipe which carries the burner is screwed into the bottom of the air-chamber and passes up within it until it is near the top; it may also be adjustable. The upper or inlet end of the pipe is provided with a concave conical mouth into which the gas-supply cone goes; its position being regulated by adjusting either the vertical tube of the air-chamber or the pipe which carries the burner. The gas-supply cone is screwed into the top of the vertical tube of the air-chamber, and the gas passes directly into the cone to be heated as it is mixed with the heated air. Or it may be heated before so doing, in which case an annular chamber is formed on or near the underside of the air-chamber, and the gas supply is coupled to it, while another pipe from the opposite side rises up and then turns down—being coupled to the gas-supply cone. The gas in passing through the chamber is thus delivered for mixing with the heated air in a heated condition, and at an increased pressure.



Anderson's Incandescent Burners.

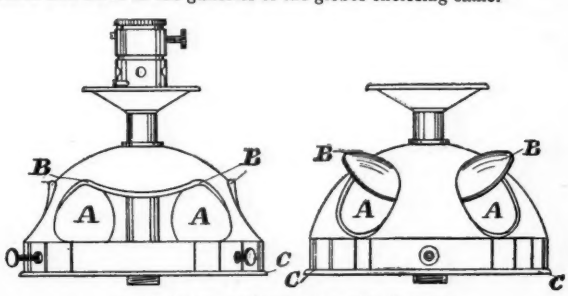
When an anti-vibrator is used, the outer tube, which carries the spring, is carried by the gas-cone or by the pipe leading into it. The tube is closed at the top and open at the bottom—terminating in an internal flange, on which the spiral spring rests. The top of the vertical tube of the air-chamber has an external flange; and between these two flanges the spring operates. The top of the vertical air tube is closed by a flanged cover whose under side is faced with an asbestos ring and kept close down on it by a spiral spring.

Inverted Incandescent Gas-Lamps.

BIHELLER, S., of Chiswell Street, E.C.

No. 8330; April 10, 1907.

The patentee proposes to provide smoke tops for inverted gas-lamps which also serve as the galleries of the globes enclosing same.



Biheller's Smoke Top for Inverted Burners.

The top is made in two parts—the outer part of metal, in which are one or more apertures A. The inner part is of china or other ceramic material. It is similarly provided with apertures; but these apertures of the inner part have flaring lips B, which project outward through the metal part so as to form a shield or roof for the corresponding aperture. The lower edge of the inner part is flanged at C, to protect the rim. The screw holes of the inner part are elongated—partly for the readier accommodation of the screws, and partly to allow for the difference in expansion of the parts when heated.

When the lamp is in use, the inner part serves not only as a protection to the metal above, but it will also reflect light downwards. Even though the two parts fit one another closely, a slight amount of air will always circulate between them and tend to keep the metal cool. The lips B throw the rising currents of gases outward and further assist in protecting the portions above.

Incandescent Gas-Lamps.

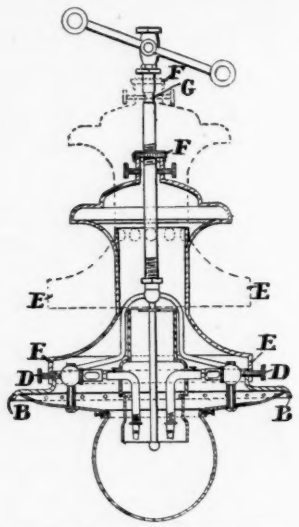
BIHELLER, S., of Chiswell Street, E.C.

No. 8331; April 10, 1907.

The object of this invention is so to construct a lamp or lantern as to permit the burner or burners to be reached from above and without interference with the glass globe or shade.

The whole of the parts are supported on the supply pipe, to which is attached the usual reflector and a gallery to support the globe or shade. From the main supply pipe smaller pipes (each serving a single burner) extend outwards and downwards so that at convenient points these small pipes adjoin the reflector or gallery, or are carried through it. Preferably, however, the reflector is affixed to the small supply pipes as shown. Where the small pipes reach the reflector, there are inserted in them valves or stop-cocks D, the regulating screw of each

extending to the outside of the lantern so as to be independently set without interfering with any other part. The reflector B is open at the top, but has a seating for the hood hereafter described.



Biheller's Incandescent Gas-Lamp.

The upper part of the lantern is formed by a hood E, preferably made of metal, and capable of sliding on the main supply pipe. Just above the hood a cap F is provided (sliding on the main supply pipe), internally threaded, so as to screw down upon a male thread on the main supply pipe when the hood is in its normal position. A suitable distance above this male thread a groove or collar G is provided for the reception of the set screws in the top of the hood.

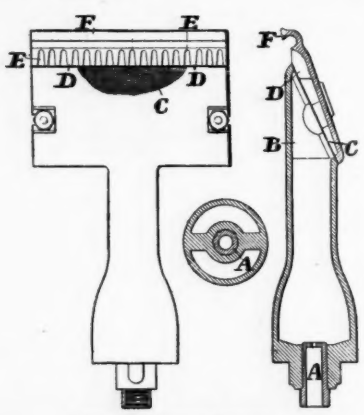
When the lantern is ready for use, the hood rests upon its seating on the reflector, and the cap F is screwed down so as to close the top of the hood and prevent access of rain, condensed water, and dust to the interior. When, however, access is desired to the interior, the cap is unscrewed, and the hood, with the cap, is raised until the screws in the top of the hood are level with the groove or collar for its reception, and will then be fixed by such screws in the raised position, as shown.

Bunsen Gas-Burners.

RUUD, E., of Pittsburg, U.S.A.

No. 21,995; Oct. 5, 1907. Date claimed under International Convention, May 9, 1907.

This invention relates to bunsen gas-burners of the type described in patent No. 9284 of 1904; and its object is "to more effectually prevent 'flashing' or 'back firing,' as well as to simplify and economize the construction of the appliance."



Ruud's Bunsen Burner.

The arrangement shown is applied in connection with a gas and air mixer of the ordinary type, consisting of a tubular body or shell which surrounds a supply passage for gas and air, and is flared or conically enlarged at its lower end, which is open for the reception of air, into which a gas-supply pipe A projects for a short distance. The upper portion of the body opens directly into a laterally extended or expanded discharge chamber B—preferably of rectangular section and entirely open at its front, which is inclined relatively to the body. A burner-plate C (either of perforated metal or wire gauze) is fitted over the inclined open front of the discharge chamber, and is held thereon by a cap-plate, of similar contour to the discharge chamber, and flanged on its edges which abut against the burner-plate, so as to be separated from it by an intervening space which is deeper at the top than at the bottom. A plurality of vertical ribs or partitions D are cast on the inner side of the cap-plate adjacent to its top, which extends above that of the discharge chamber—the spaces between the ribs constituting a plurality of separate and independent discharge channels E disposed throughout the width of the cap-plate, and open at each of their ends, through which the mixture of gas and air passes to the atmosphere. A curved lip F extends across the top of the cap-plate, above the discharge channels, projecting over the joint between the discharge chamber and the burner-plate and serving to prevent access of water to the channels and joint.

In operation, combustion of the mixture of gas and air which enters the discharge chamber B is maintained near the perforations in the upper portion of the burner-plate C; and the flame is thrown out in a plurality of independent jets through the discharge channels E. It has been found in practice that by the provision of independent channels, in lieu of the single discharge opening extending entirely across the cap-plate (as in the patent to which reference has already been made), the liability of the mixture to burn down into the space within the cap-plate and on the burner-plate is eliminated.

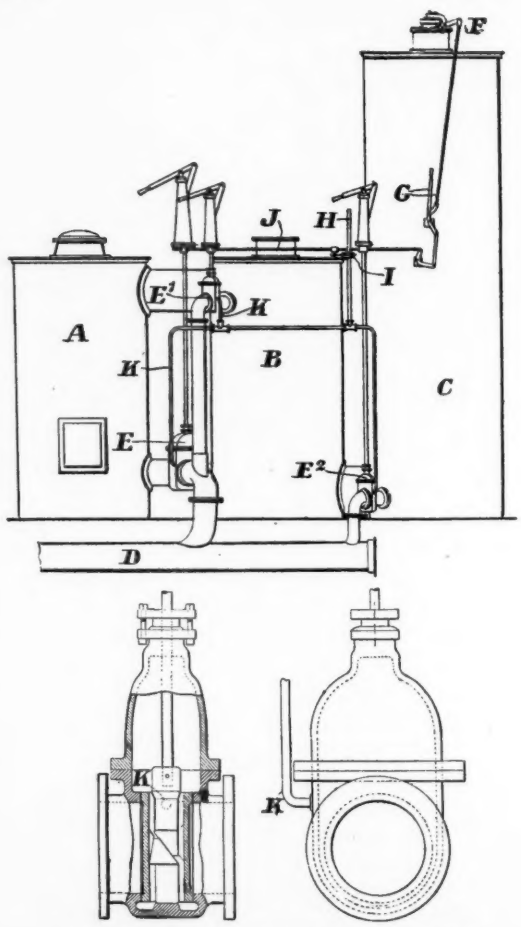
Water-Gas Apparatus.

CARROLL, L. D., of Victoria Street, S.W.

No. 17,986; Aug. 7, 1907.

The object of this invention is to prevent gas or air leaking past the air-blast valves of water-gas apparatus and mixing with air in the air-main or gas in the passage or chambers of the apparatus, so as to cause explosions and damage to the apparatus or to workmen.

For this purpose each air-blast valve—which comprises two discs or the like adapted to be closed against suitably arranged seats—is provided with an atmospheric (or low-pressure) vent from the space between the discs; and the vent is furnished with a valve connected with some interlocking mechanism in such a manner that when the apparatus is in operation and an air-blast valve is open its vent will be closed, but when an air-blast valve is closed its vent will be open. Thus leakage of gas or air past either disc of the blast valve "is harmlessly discharged from the intermediate space before it can acquire sufficient pressure to leak past the other disc and possibly cause an explosion."



Carroll's Valve Arrangement for Water-Gas Plant.

The engraving shows water-gas plant provided with interlocking mechanism as described in patent No. 24,934 of 1897 (Humphreys and Glasgow), and in which, according to the present invention, means are provided for preventing explosive mixtures of air and gas being formed by leakage past an air-blast valve. A section and elevation through an air-blast valve with a controlled vent are also shown.

Communication between the air-blast main D and the generator A, carburetter B, and superheater C, is controlled by valves E, E^1, E^2—each constructed as shown—K being the vent-pipe communicating with the space between the two valve discs. The pipes K of the valves E, E^1, E^2 may be connected with a pipe H discharging into the atmosphere above the operating floor of the apparatus. F is the stack-valve and G the stack-valve actuating mechanism which is interlocked with the actuating mechanism of one or more of the valves E, E^1, and E^2 by means of an interlocking rod J, which is moved when the stack-valve is moved.

I is a valve controlling the passage through the discharge pipe H. It is connected to the interlocking rod J in such manner that when the stack-valve F is opened the vent discharge will be closed, but when it

is closed the vent will be open. The vent-pipes L of the several valves may discharge separately instead of into a common pipe, and be provided with separate valves actuated, it may be, from different parts of the interlocking mechanism of the apparatus.

The present invention, it is remarked, may be embodied in water-gas apparatus of the kind described in the specification of Frederick Thuman's patent, No. 6335 of 1904.

APPLICATIONS FOR LETTERS PATENT.

28,181.—Rusby, J. M., "Water-gas apparatus." Dec. 21.
28,196.—Schulz, G., "Gas-irons." Dec. 21.
28,217.—Delage, M., "Grates for heating by radiant heat." Dec. 21.
28,237.—Ross, W., and Kennard, A. M., "Gas-stoves." Dec. 23.
28,247.—Radcliffe, J., "Purification of effluents containing compounds of lime." Dec. 23.
28,290.—Bauer, T. von., "Coke-ovens for the recovery of bye-products." Dec. 23.
28,301.—Barber, G. H., and Barrett, S. R., "Inverted mantles and fittings." Dec. 23
28,316.—Thorp, T., "Calorimeters." Dec. 24.
28,317.—Thorp, T., "Gas pressure-gauges." Dec. 24.
28,343.—Thorp, T., "Rotary meters." Dec. 24.
28,360.—Keith, J. & G., "Gas-lamps." Dec. 24.
28,387.—Kirkham, Hulett, & Chandler, Ltd., and Hersey, S., "Washer-scrubbers." Dec. 24.
28,390.—Feld, W., "Treatment and purification of gases, and the obtainment of products therefrom." Dec. 24.
28,393.—Biheller, S., "Inverted lamps." Dec. 24.
28,407.—Delage, M., "Refractory bodies called radio-incandescent for heating by radiation." Dec. 24.
28,437.—Gerdes, A. F., "Opening and closing gas-cocks for igniting gas at a distance." Dec. 27.
28,439.—Tomlinson, T., and Mills, A. E., "Peat drying by means of the waste heat of gas-engines." Dec. 27.
28,462.—Potter, W. G., "Inverted lamps." Dec. 27.
28,508.—Stott, J., "Gas-governors" Dec. 27.
28,519.—Wood, W. H., "Inverted burners." Dec. 28.
28,571.—Hill, J. H., "Adapter for inverted lighting." Dec. 30.
28,599.—Fasbender, F., "Gas-turbine." Dec. 30.
28,663.—Mansfield, W., "Gasholders." Dec. 31.
28,688.—Watson, J., "Liquid meter." Dec. 31.
28,692.—White, W. C., "Treatment and distillation of coal." Dec. 31.
28,698.—Lines, H. G., "Regulator for controlling the supply of gas to incandescent burners." Dec. 31.
28,706.—Hellstern, O., and Vincent, G. T., "Improvements in lighting." Dec. 31.
28,708.—Gelli, C., "Joint for gas and water conduits." Dec. 31.
28,763.—West, J., "Lubricating conveyor wheels." Dec. 31.
6.—Winpenny, A. R., "Rotary blowers, &c." Jan. 1.
30.—Wethered, H. L., and Ball, G., "Valves and cocks." Jan. 1.
36.—Quincey, S., and Harrison, C., "Valves." Jan. 1.
70.—Cloudsley, J. L., jun., "Lighting and extinguishing gas-lamps." Jan. 1.
78.—Pryce, H. J., "Controlling gas-lights." Jan. 1.
88.—Hooper, W. H., and Hutchins, F. S., "Gas-engine." Jan. 1.
100.—Lee, F. & H., "Heating irons by gas." Jan. 2.
126.—Worthington Pump Company, Ltd., and Mueller, O. H., "Condensers." Jan. 2.
138.—Sheldon, S. B., "Distilling coal." Jan. 2.
144.—Smithdale, A. E., "Manufacture of gas." Jan. 2.
180.—Hurdle, F. O. N., "Valves." Jan. 3.
210.—Hughes, W. B., "Gas heating." Jan. 3.
217.—Szperkowski, A. B., "Pressure-regulating valves." Jan. 3.
227.—Jackson, S. A., "Incandescent gas-lamps." Jan. 4.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Costs and Treatment of Hostile Witnesses in Rating Appeals.

Sir,—On the chance that it may be interesting to your readers, I send the statement of the costs of the respondents in the recent appeal of this Company against the increased rating in certain Unions, in which our appeal was dismissed with costs. I believe this result was mainly due to the respondents—assisted by Mr. George Helps—inducing the Court to take their view that slot meters, stoves, and fittings were rateable, while ordinary meters and stoves never had been. This was their main contention against both the South Metropolitan and the Ipswich Gas Companies. Happily, in the Ipswich case (as recently reported in the "Journal"), three Judges of the King's Bench Division, in a unanimous decision, have declared, without even calling on the Counsel for the Gas Companies (for there were others in it besides the Ipswich Company), that none of these things are rateable. The battle therefore is not lost; and although fighting is expensive, it is, as was remarked to me by the proprietor of Hay's Wharf after a great strike, "cheaper than giving way."

Here are the figures as to costs of the respondents' witnesses; more than half of the total being taxed off.

SOUTH METROPOLITAN GAS COMPANY.—RATING APPEALS, 1905-7.

SUMMARY OF RESPONDENTS' COSTS.

Total Amount of Costs of all the Respondents, as Delivered.	Total Amount Taxed Off.	Total Amount of the Bills after Taxation, excluding Court Fees for Taxing.	Total Amount *Charged* by Respondents' Witnesses.	Total Amount *Allowed* to Witnesses by the Court.
£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
10,317 13 9	5401 19 4	4912 14 5	5204 13 5	2127 13 9
			Made up as follows:—	Made up as follows:—
			Mr. Dinwiddy . . £3237 11 7	Mr. Dinwiddy . . £739 6 6*
			,, Mason . . . 526 13 10	,, Mason . . . 259 6 9
			,, Eve 551 12 0	,, Eve 465 10 0
			,, Helps . . . 697 15 6	,, Helps . . . 474 5 6
			,, Elwell . . . 141 15 0	,, Elwell . . . 141 15 0
			,, Vivian . . . 49 5 6	,, Vivian . . . 47 10 0

* This amount is made up of 600 guineas for fees, *plus* £109 6s. 6d. for disbursements, plans, &c.

The fourth and fifth columns are the most noteworthy; the amount taxed off, to be paid by the Unions, being £3077 out of £5204. Mr. Dinwiddy, the adviser of the Unions, has to suffer the largest reduction. But there is one name, long honoured in the gas industry, in the list which I am very sorry to see. It is that of Mr. George Helps, of Nuneaton, whose charge of £697 15s. 6d. is made up thus—

Fifty-six days at £10 10s.	£588 0 0
Out-of-pocket expenses	78 5 0
Printing	31 10 6
	£697 15 6

I am not treating Mr. Helps unfairly by mentioning this; for he has been accorded by us every consideration. Early during the preparations for the case, I pointed out to him that it was a very anomalous position for the chief officer of a gas company to take the side of, and to assist, the enemy; that his was the first case of the kind in my experience; and that his own Company might be attacked. I not only pressed this upon him before but after the appeal. When he first came, I told him that he could claim no information from us beyond an inspection of our books—that we were not bound to answer a single question, or to explain anything. His reply was that in that case he could do nothing. Then, regarding him as a brother gas man, and feeling that our case was good, and thinking a witness of this kind, not hostile to gas companies, might be an element in the case leading to a fair and friendly settlement, we gave him every information and explanation he asked for or required. I am now exceedingly sorry we acted in this generous manner; and I venture to suggest to others who may be in a similar position that they should give nothing more than they are legally compelled to do to hostile witnesses. Mr. Helps was against the Company in the Ipswich case, and has been so in others past and present. It is for this reason that I venture to make the above suggestion.

The costs of the Company I am glad to say are very much less than those of the respondents. The regrettable thing about it all is that so much money should be wasted, to the loss of both consumers and ratepayers. But, so long as the present iniquitous system of rating gas companies lasts, it will never do to give up the contest for fear of the cost.

George Livesey.

South Metropolitan Gas Company,
709, Old Kent Road, S.E., Jan. 10, 1908.

Use of Fire-Hydrants without Payment.

Sir,—I should be glad to have, through the medium of the "Journal," the views of any one who has had experience in circumstances similar to the following: A Water Company, having their own Private Act, which incorporates the General Act of 1847, some years ago laid down a number of mains in the rural district, and at the time arranged with the Rural District Council as to the payment of a small quarterly sum in consideration of certain fire-hydrants being attached thereto. After a while the Council declined to pay the charge; being advised that they could not legally do so. The several Parish Councils also decline to make any payment; so the hydrants will probably be removed.

In the meantime, the local borough Fire Brigade use the hydrants, without any monetary acknowledgment, for the purpose of extinguishing fires; the Town Clerk contending that they have a perfect right to do so, inasmuch as the hydrants are actually fixed, and the Company are bound to allow them to be used under section 42 of the Act of 1847. The Company say that this contention is absurd—that the "appliances" are not fire-plugs until an arrangement is made, under section 38, with some authority that they should be used for the purpose of extinguishing fires. Until then they are the private property of the Company, and really the Fire Brigade are liable to a penalty for interfering with them. Which view is correct?

Water-Works.

Jan. 7, 1908.

LEGAL INTELLIGENCE.

LIVERPOOL GAS-WORKS NUISANCE CASE.

Last November, at the Liverpool Police Court, the hearing was commenced (see "JOURNAL," Nov. 26, p. 653) of a case in which the Gas Company were summoned for carrying on at the Wavertree works a business which caused unnecessary annoyance to the residents. After hearing the evidence of the Chief Smoke Inspector of the Corporation (Mr. Macaulay) and two residents, who said that a nuisance had been caused in the neighbourhood by the emission of smoke and by noise and dust from the works, the Stipendiary Magistrate (Mr. W. J. Stewart) adjourned the case to allow of the parties agreeing on an independent expert to go into the matter, or of the prosecution obtaining expert evidence.

The case was called on again last Wednesday, when Mr. H. S. Duder, who appeared for the Health Authority, said that since the matter was last before the Court the nuisance complained of had been very much abated; and there had been a consultation between experts, in accordance with the suggestion made by the Stipendiary Magistrate. The Gas Company had undertaken to carry out certain suggestions made by the Corporation expert; and as a result he (Mr. Duder) proposed to withdraw the summons, as he believed the object of the prosecution would be accomplished. Since the last appearance in Court, a suggestion then made by the Smoke Inspector had been patented by a gas engineer. The Stipendiary: Not in consequence of what was said in Court, I hope? Mr. Duder: No. The Stipendiary: I suppose it was only the effect of two great minds operating at the same moment. The prosecution was withdrawn.

MISCELLANEOUS NEWS.

SULPHATE OF AMMONIA MARKET.

Messrs. Bradbury and Hirsch's Review for the Past Year.

We have received from Messrs. Bradbury and Hirsch, of Liverpool, a copy of their "Review of the Market for Sulphate of Ammonia during 1907;" and, as on previous occasions, we extract from it the portions with which our readers are most closely concerned.

Before commencing their review of the nitrate of soda and sulphate of ammonia markets, Messrs. Bradbury and Hirsch follow their usual practice of making a few observations upon trade and manufacture in general, and upon the fertilizer trade in particular. With regard to the latter, they say that the outlook is not unpromising, though, owing to the stringency of money and the check which has been given to industrial enterprise everywhere, it is not so good as it was a year ago. Still, there is every probability that money will be cheaper before the spring months are entered upon; and from every quarter of the world, except from the Canadian Far West and the interior of Argentina, it is admitted that if the standard of crops is to be maintained, or if crops worth the growing are to be produced, resort must be had to fertilizing. Notwithstanding promises made from year to year, progress in the extraction of nitrogen from the atmosphere for fertilizing purposes is but slow; and, so far, the quantities produced have not been large enough to affect the market in any way.

Turning to the subject of nitrate of soda, Messrs. Bradbury and Hirsch remark that, in order to realize that it is by far the most important factor in the world of nitrogenous fertilizers, it is only necessary to imagine what the effect of a shortage of supply would be upon the value of sulphate of ammonia—what it would mean directly or indirectly to agriculturists everywhere. They make no apology, therefore, for again discussing the nitrate situation before proceeding to the review of the market for sulphate. At the end of 1906, they calculated that the supply for the ensuing four months – January-April—would be somewhere about 840,000 tons, or 71,000 tons more than that for January-April, 1906. Owing to the presence on the west coast of stocks larger by 40,000 tons than those at the end of 1905, and it being uncertain in what direction the extra quantity might be shipped early in 1907, it was difficult to estimate very exactly what the supply for January-April in Europe would be; but they stated the reasons which guided their judgment. The actual supply proved to be 855,250 tons, or 15,250 tons more than their estimate—viz., deliveries from ports, 727,250 tons; stocks brought forward into May, 128,000 tons.

Two inquiries arise out of these figures: How the actual supply came to exceed the estimate; and why deliveries show an increase of less than 5000 tons upon those for the corresponding period of 1906? The authors endeavour to answer them in their order. They say it was obvious that early in the year an effort would be made to remove the surplus stock on the west coast; and, in view of the conservative attitude of the United States during the greater part of 1906, and of the comparatively moderate supply actually in that country, it was thought that the bulk of the excess stock on the west coast would be required by the United States market in order to deal effectively with the spring demand. This expectation was not justified by events; most of the extra stock being sent to Europe, and shipments to the United States being below the level for the same period in 1906. Hence the larger actual supply for Europe for January-April.

When they come to inquire why there should have been so little expansion in consumption, they say they have not far to look—after the event. Owing to unfavourable weather, there was from the outset some falling off in deliveries. This could, however, have been easily adjusted but for the unfortunate strike at Hamburg in March and April, which most seriously hampered the work of delivery there. The set-back was in fact only at Hamburg; deliveries from that port up to the end of March being 50,000 tons in arrears, though the stock was 38,000 tons greater than that at the end of March, 1906, and though buyers were clamouring for deliveries. In April the strike came to a conclusion, and the set-back was partly adjusted before the end of the month. But the lost ground was never altogether recovered; and, at the end of June, Hamburg deliveries were still 22,000 tons in arrears, though the United Kingdom and Continent deliveries showed an increase of 18,000 tons compared with January-June, 1906.

Starting with a high level of prices, and with the prospect of an ample supply for the consuming season, buyers were in no hurry to cover their requirements, and values declined slightly. In February, wintry weather tended further to keep buyers quiet; but, arrivals being delayed by easterly winds, there was an improvement in demand and in prices in the latter part of the month, though the actual situation hardly justified higher prices. The advance was maintained through March; but heavy arrivals on the top of heavy stocks were facts too strong to be resisted, and in April the price was down to 11s. 1½d. per cwt.—1½d. per cwt. below the year's starting-point. In May there was a drop to 10s. 7½d. per cwt.; but in June the statistical position having materially improved owing to moderate shipments in that and the preceding month, there was a recovery to 11s. per cwt. Prices on the Continent fluctuated more widely, due to the scarcity of supplies in the interior while the Hamburg strike was proceeding and to the too abundant supplies at the ports later. The announcement in May that the Committee of Producers had provisionally fixed the maximum quantity permitted to be shipped to all parts for the twelve months from April, 1907, to March, 1908, at 45 million quintals (85 per cent. only of the quotas by the end of December) did not much affect the market; the figure being what was expected, and it being recognized that production is now practically limited by the limitation of available labour at the Officinas. Up to the end of October the market in the second half of the year was singularly uneventful. Deliveries were barely on a level with those for the corresponding months of 1906; but, owing to smaller shipments, the excess visible supply at the end of June was being gradually reduced. The price improved to 11s. 1½d. per cwt. in August, and to 11s. 3d. per cwt. in October; but in November, financial stringency having made itself felt in this as in other trades, there was a set-back to 11s. per cwt., although the statistical position had further improved. In December the situation was very materially altered by strikes at Iquique and other shipping ports, involving the stoppage of shipments for the time being. By the end of the month, however, all questions in dispute had been adjusted. The spot price was advanced to 11s. 4½d. per cwt.; but at the close it was down to 11s. 1½d. Cargoes for spring arrival, which in November were neglected, were in demand for a short time at advanced prices, but were in less request at the end of the month.

A very large business in cargoes was done during the year; and Messrs. Bradbury and Hirsch give the following outline of prices f.o.b. on the west coast: At the outset buyers were shy; the market appearing to be overloaded with visible supply and stocks on the coast. Quotations dropped from 8s. 6d. to about 8s. 1½d. per quintal in January. In February there was an advance to 8s. 3½d., and in March a further advance to 8s. 7½d. per quintal; but the reason was not very obvious. In April the figure went down to 8s. 4d.; but there was a recovery to 8s. 8d. In May the price fluctuated between 8s. 10d. and 8s. 8½d.; in June it rose from 8s. 9d. to 8s. 11½d.; and in July to 9s. Through August and September the price varied between 9s. and 8s. 11d. per quintal. In October there was a set-back to 8s. 7d.; and 8s. 3½d. was the figure at the end of November. The closing value was 8s. 2d. for ordinary quality, prompt delivery. The supply for January-April this year is estimated at 841,000 tons, or 14,000 tons less than was available for the corresponding months of the past year. Should the actual supply be not more than the above-named quantity, and if a larger Continental consumption may be relied upon, will the extra consumption be large enough to sustain prices at their present level through the season? The authors think it will, though they are aware that the stock brought forward into May last was no less than 128,000 tons, and that the market broke down under the weight of it and impending arrivals. They look for an increased demand on the Continent to the extent of at least 20,000 or even 30,000 tons. They, however, assume 20,000 tons; and adding to this 14,000 tons for the smaller actual supply, they have a difference of 34,000 tons between what they expect in 1908 and the actual supply and demand over January-April in 1907. Deducting 34,000 tons from 128,000 tons—the stock at the end of April last—there will be a stock of 94,000 tons at the end of next April, if their figures prove to be correct. The point is: Will the market stand this? They think it will, because in no recent years have stocks in Europe gone much below 70,000 tons during the spring season without inflating prices; and the difference between 94,000 tons and 70,000 tons is not enough to alarm holders, providing impending arrivals are not exceptionally heavy.

Coming to sulphate of ammonia, Messrs. Bradbury and Hirsch remark that when they were considering the situation at the end of 1906 they were not able to take a very sanguine view of the outlook, for reasons which they stated at some length, and to which they again refer briefly. They thought the Continent would do something more than absorb the increased German production over the spring months—the period under consideration. They did not anticipate any increase in Spanish requirements over the early months of the year; but, on the other hand, they did not count upon any falling off. Tables of exports are given, which show how far their expectations were realized. From them, we take the following figures: To France, Germany, and Belgium, 33,024 tons; to Spain, Italy, and the Canaries, 57,406 tons; to Holland, Java, British Guiana, the West Indies, and the Mauritius, 40,379 tons; to the United States, 24,920 tons; and to other countries, 75,808 tons (Japan taking 64,270 tons, against 33,237 tons in 1906, 33,861 tons in 1905, 14,981 tons in 1904, and 3612 tons in 1903)—making a total of 230,537 tons, against 201,456 tons in 1906, 189,349 tons in 1905, 177,287 tons in 1904, and 162,217 tons in 1903.

The two outstanding features of the year's business were undoubtedly the enormous shipments to Japan, and a shrinkage in shipments to Holland and the sugar growing Colonies; and Messrs. Bradbury and Hirsch think they both call for more remark than a passing reference. Among the many notable developments in Japanese commerce and industries in recent years, that of the fertilizer industry has been one of

the most remarkable. Ten years ago it scarcely existed, except on very primitive lines. Now it is thoroughly up-to-date and progressive. It is quite possible that in her purchases of sulphate of ammonia Japan may have overshot the mark. But her merchants and manufacturers have very definite views; and it will probably be found that if they are not realized immediately they will be eventually. The falling-off in demand for Holland and the Colonies is directly due to German competition for the orders; and the importance of this lies in the fact that German production is now in the field for export business, and must henceforth be counted upon when the sulphate of ammonia situation is under consideration.

The question of production—both at home and in Germany—has, after all, been the all-important question. That output would be increased both in the United Kingdom and in Germany was expected; but the rate of increase has passed all expectations, and Messrs. Bradbury and Hirsch say it has been largely due to extraordinary activity in the iron and steel industries of the world. Dealing first with production in the United Kingdom, they estimate that, notwithstanding the use of water gas along with coal gas, which yearly becomes more general, the larger use of incandescent burners, and the extension of electric lighting, the output of sulphate of ammonia from gas-works has increased some 5000 tons. The increase from shale-works is estimated at 2500 tons, and from iron-works at 1000 tons. The extension of the use of the Mond process in the production of gas still proceeds, though slowly; and the additional yield of sulphate of ammonia from this source has been about 3000 tons. The most remarkable increase has been from carbonizing-works, probably due more to the abandonment of the old bee-hive ovens and the adoption of the bye-products ovens than to the actual increase in the quantity of coal carbonized. The output from this source is estimated to have risen no less than 15,500 tons within the past year. The production of ammonia, therefore, calculated into sulphate (including that used in the manufacture of ammonia soda and for other chemical purposes), from all sources in the United Kingdom in 1907 is estimated at 316,000 tons, apportioned as follows:—

	Tons.
Gas-works	162,000
Iron ,,	22,000
Shale ,,	51,000
Coke and carbonizing works and producer gas	81,000
	316,000

Of this production, the authors reckon that England contributed 206,500 tons; Scotland, 107,000 tons; and Ireland, 2500 tons. The production (in tons) during the previous five years was as follows:—

	1906.	1905.	1904.	1903.	1902.
Gas-works	157,000	156,000	150,000	150,000	150,000
Iron ,,	21,000	20,000	19,500	19,000	18,500
Shale ,,	48,500	46,000	42,500	37,500	37,000
Coke and carbonizing and producer gas	62,500	46,500	33,500	27,500	23,500
Totals	289,000	268,500	245,500	234,000	229,000

Their estimate of production during 1906 was rather below the mark; the error being mainly in the estimate of production from carbonizing works, exact particulars in regard to which could not be obtained in advance. Assuming 17,000 tons for the stocks, the account for 1907 will stand as follows:—

	Tons.
Stock brought forward from 1906	17,000
Production in 1907	316,000
	333,000
Exports during 1907	230,000
Home consumption (for all purposes) in 1907	87,500
Stock to carry forward into 1908	15,510
	333,000

Notwithstanding the slow market since the middle of November, the past year closed without any great accumulation of stock at any point in the hands of makers beyond what may be called working stock. Messrs. Bradbury and Hirsch say this position is due to the fact that in November stocks were reduced to a minimum, and that contracts made in advance, with supplementary purchases, have practically kept pace with current production since. The large makes were, in fact, all sold in advance, and, notwithstanding a falling market until towards the close, the smaller makers have for the most part disposed of their supplies as they have become available. The more serious factor for consideration is therefore the probable production over the ensuing four or six months. Is it likely to be on the same scale as that over the same period in 1907, or on a larger scale? The authors think it will be somewhat larger, and that the increase will be mainly from carbonizing works. Though it is reported that further new concerns are contemplated, they cannot in any case affect the near future. What has to be taken account of is the substitution of bye-products ovens for the old beehives, which was pushed forward last year, and is to be further proceeded with, more particularly in the Tyne district. Not much increase is expected in the output of sulphate of ammonia from gas-works—the industrial outlook for 1908 not being very promising; and for the same reason it is not thought that the output from other sources is likely to show much progress.

On the whole, the authors think the market must count upon a production from all sources in the United Kingdom larger by 6000 or 7000 tons during the next four months than was available over the corresponding period in 1907. Before, however, the question of adequate demand for the production of the United Kingdom can be profitably discussed, some account must be taken of the production in other countries, and particularly in Germany, where the output is mainly from carbonizing works. The total output of sulphate of ammonia in Germany in 1907 is computed at 287,000 tons. If this estimate is correct, it means an increase of 31,000 tons upon the output in 1906. As in the United Kingdom, so in Germany, the large increase in the production of sulphate has been due in great measure to the abandonment of old ovens and the construction of new ones which work far more efficiently, and give a higher yield of sulphate at the same cost of working. Reconstruction is still proceeding; and the authors are afraid that a larger output of sulphate during the coming months, even with the possible closing-down of some coking-ovens, must be looked for, because the ovens reconstructed during 1907 are now in operation. There was also some increase last year in the output from gas-works in France, Spain, and other countries; but it was comparatively small in each case, though appreciable in the aggregate. Not much advance is expected in the present year.

If, then, larger production must be looked for in the United Kingdom and probably in Germany, and some increase in other countries, what are the chances of supplies being absorbed, and of the present level of prices being maintained? To what countries may we look for increased demand? Messrs. Bradbury and Hirsch are afraid that it is hopeless to look to the Continent for much support; and, seeing that part of the demand in March and April last was occasioned by an exceptional circumstance, it will be satisfactory if there is no falling off over January-April this year. From Spain, however, they look for some increased demand. The United States will continue to draw her outside supplies mainly from the United Kingdom; but unless the present financial troubles are removed or relieved, there seems to be no prospect of last year's demand being reached. The demand for Japan in 1907 was so extraordinary, especially within the past six months, that it may well be doubted whether the pace can be sustained. It is difficult to understand how a country which five years ago took less than 4000 tons of sulphate of ammonia can now absorb 64,000 tons; and yet, as already shown, this quantity went to Japan last year. Several circumstances have contributed to the development of the fertilizing industry there, and to this large demand for sulphate. The impossibility of obtaining bean cake from Manchuria during the war made it necessary to substitute some other fertilizer; and sulphate of ammonia, among other things, was seized upon. Then, since the war, agriculture has been stimulated in every way; and it is as yet quite impossible to estimate what the end may be in this direction in a country like Japan, and among a people like the Japanese. The purchase of the railways by the State will, no doubt, have the effect of improving and extending the means of transit in the interior. The assumption of complete control of Korea, and the infusion of the Japanese spirit there, must mean better agricultural methods; and probably some of the sulphate of ammonia taken by Japan may find Korea its ultimate destination. Seeing, too, that the Japanese are making a bold bid for the Pacific and Australian superphosphate trade, it is likely that sulphate of ammonia may find its way into compound manures for export. Notwithstanding all this, Messrs. Bradbury and Hirsch are inclined to think that shipments over the near months will not very greatly exceed those during the early months of 1907, which averaged only about half as much per month as those for August-September. At all events, shipments are not likely to be on anything like the scale of those effected during recent months.

The one other factor to be considered is that of nitrate of soda. If the stability of its market is assured, and if at least the present level of prices can be depended upon, as Messrs. Bradbury and Hirsch think it can be, the effect must be that sulphate of ammonia will be in greater request in countries consuming nitrate of soda, especially on the Continent; and instead of Germany exporting sulphate over the coming spring months, she may find enough to do to keep her former ground on the Continent supplied. If, as seems likely, the price of nitrate of soda is maintained at £11 5s. or £11 10s. per ton over the spring months, then anything under £12, or even £12, per ton for sulphate of ammonia is, in the authors' opinion, absurd; and there is bound to be a further reversion to the use of it for every purpose for which it can be employed. This, they say, must be so in the United Kingdom and in Germany especially, since nitrate of soda is further handicapped by inland carriage; while sulphate of ammonia is practically at the doors of buyers. In France and Belgium there is not the same handicap; but the disparity in relative values is more than sufficient incentive to induce the use of sulphate of ammonia wherever possible.

Owing to the worse industrial outlook, at home and abroad, Messrs. Bradbury and Hirsch do not anticipate any great increase in the output of sulphate of ammonia over the next four months. Nor do they, on the other hand, count upon much expansion in the aggregate of demand, for the reasons they have stated. They do not think that increased demand will do much more than keep pace with increased output; so that much improvement on present prices can hardly be looked for.

The "Review" concludes with the usual record of the course of the market month by month; and this is followed by the customary tabulated statistics. The first table contains the comparative weekly prices of sulphate of ammonia and nitrate of soda last year. In the week ending Jan. 5, sulphate was £11 12s. 6d. and nitrate £11 5s. per ton; on April 6, the prices were £11 15s. and £11 10s.; at Midsummer, they were £11 15s. and £11; at Michaelmas, they were £11 15s. and £11 2s. 6d.; while at the close of the year, they were £11 13s. 9d. and £11 2s. 6d. respectively. The second table shows the average prices per cwt. of 95 per cent. nitrate of soda, in Liverpool, for the past ten years. They are as follows: 1898, 7s. 6¾d.; 1899, 7s. 11¾d; 1900, 8s. 5¼d.; 1901, 8s. 11½d.; 1902, 9s. 4d.; 1903, 9s. 6½d.; 1904, 10s. 2½d.; 1905, 10s. 9½d.; 1906, 11s. 4d.; and 1907, 11s. 2d. The third table gives the average prices per ton of good grey (24 per cent.) sulphate f.o.b. Hull; the figures ranging over 41 years—1867 to 1907. The following are the averages for the past ten years: 1898, £9 9s. 7d.; 1899, £11 5s. 10d.; 1900, £11 2s.; 1901, £10 11s. 4d.; 1902, £11 16s. 3d.; 1903, £12 9s. 2d.; 1904, £12 3s. 8d.; 1905, £12 10s. 9d.; 1906, £12 0s. 9d.; 1907, £11 15s. 8d.

Frost and Burst Water-Pipes.—Referring last Wednesday to the effect of the recent severe weather on the water-pipes of the Liverpool Corporation, Alderman Burgess, the Chairman of the Water Committee, stated that, owing to the frost, 700 repairs to pipes had been already effected; and he anticipated that the number would run up to 2000. On the previous day, the consumption of water was 41 million gallons, against a normal 28 millions.

GAS AND WATER PROFITS AT WIDNES.

Rejection of the Proposal to Use them to Relieve the Rates.

It was shown in the last number of the "JOURNAL," by extracts from some letters which had appeared in a local paper, that the clause in the Bill of the Widnes Corporation by which power is sought to vary the existing Act so as to allow of the gas and water profits being handed over for the relief of the rates, was exciting much interest. The ardour with which the burgesses had taken up the matter was strikingly manifest at the public meeting held last Tuesday to consider the Bill. It was called for noon; but long before this hour the Town Hall was besieged by ratepayers anxious to gain admittance. When it was obtained the Council Chamber was absolutely packed. The Mayor (Alderman S. Owens) presided.

The proceedings commenced with the reading by the Town Clerk (Mr. H. S. Oppenheim) of the notice convening the meeting, and the following extracts relating to the gas and water undertaking from the Act of 1867 and the proposed Bill:—

Existing Enactments.

Widnes Improvement Act, 1867, *sec.* 102.

The gas-works fund shall be applied as follows (that is to say): All moneys forming part of that fund, not being moneys received from the general district rate or moneys borrowed on mortgage, (1) for paying the interest from time to time payable on moneys secured by gas-works mortgages; (2) for setting apart the sinking fund for paying off the gas-works mortgages; (3) for maintaining the gas-works and in other respects carrying this Act into execution with respect to gas (except enlargements and extensions); (4) for making the enlargements and extensions of the gas-works; (5) for repaying moneys advanced for purposes of this Act with respect to gas out of the general district rate, and not repaid; and (6) for paying off the principal moneys secured by gas-works mortgages. (7) The surplus from time to time shall be carried to the general district fund of the Local Board, and be applicable accordingly.

[Section 103 contains like provisions with respect to the water-works fund.]

Widnes Local Board Act, 1875, *sec.* 36.

The Local Board may appropriate and set apart annually such proportion of their revenue arising from the sale of gas and water respectively, not exceeding £500 in any one year, as they shall think fit, and shall carry the sums so set apart to the credit of the gas-works depreciation fund or the water-works depreciation fund as the case may be The respective depreciation fund shall not exceed in the aggregate the sum of £3000, and so soon as it shall reach this amount, such appropriation and setting apart as aforesaid shall be suspended until the respective fund shall from any cause fall below the sum of £3000; and any interest arising from the respective depreciation fund shall be carried from time to time to the credit of the gas-works fund or the water-works fund, as the case may be.

Proposed New Clauses.

Widnes Corporation Bill, 1908, *clause* 11.

The Corporation shall apply their gas-works fund in manner and order following (that is to say):

1.—(1) In payment of the working and establishment expenses and cost of maintenance of the gas undertaking; (2) in payment of the interest on moneys borrowed by the Corporation for the purposes of the gas undertaking; (3) in providing the requisite appropriations, instalments, or sinking fund payments in respect of moneys borrowed by the Corporation for the purposes of the gas undertaking; (4) in extending and improving the gas undertaking; (5) in providing a reserve fund (if the Corporation think fit) by setting aside such money as the Corporation think reasonable, and investing the same and the resulting income thereof in statutory securities, and accumulating the same at compound interest until the fund so formed amounts to the maximum reserve fund for the time being prescribed by the Corporation, not exceeding a sum equal to one-fifth of the aggregate capital expended for the time being by the Corporation upon the gas undertaking, which fund shall be applicable to answer any deficiency at any time happening in the income of the gas undertaking or to meet any extraordinary claim or demand at any time arising against the Corporation in respect of the gas undertaking, or for payment of the cost of renewing any part of the gas undertaking or of the works connected therewith, and so that if that fund be at any time reduced it may thereafter be again restored to the prescribed maximum, and so from time to time as often as such reduction happens: Provided that resort may be had to the reserve fund under the foregoing provisions although such fund may not at the time have reached, or may have been reduced below, the prescribed maximum. And the Corporation shall carry to the district fund so much of the balance remaining in any year of the income of the gas undertaking (including the interest on the reserve fund when such fund amounts to the prescribed maximum) as may, in the opinion of the Corporation, not be required for carrying on the gas undertaking and paying the current expenses connected therewith.

2.—Any deficiency in the gas-works fund shall forthwith be made good out of the district fund and the general district rate.

3.—The two preceding sub-sections and this section shall apply in relation to the water undertaking as if the water-works fund had been mentioned therein instead of the gas-works fund, and the water undertaking instead of the gas undertaking.

4.—Sections 100 ("Gas-works fund to be primarily liable for gas-works expenditure"), 101 ("Water-works fund to be primarily liable for water-works expenditure," 102 ("Application of gas-works fund") and 103 ("Application of water-works fund") of the Act of 1867, and section 36 ("Depreciation fund") of the Act of 1875, are hereby repealed.

The Town Clerk explained that the sum and substance of one clause in the Bill upon which the ratepayers were asked to vote was whether after the payment of the necessary expenses, the profits should go to the relief of the rates.

The Mayor said the meeting had just heard the Town Clerk's statement, and he should be willing to have an expression of opinion thereon. At this point, a member of the Labour party entered a protest against the profits being "confiscated on behalf of the landlords." This remark was followed by a storm of applause; and it was some time before order was restored. The Mayor said he understood the only portion of the Bill to which exception would be taken was that referring to the gas and water profits. Under these circumstances, therefore, he proposed that the remaining portions of the Bill be approved. After some manifestations of dissent, the proposal was carried without opposition. The Mayor then moved: "That the electors of the Borough of Widnes hereby approve of, and consent to, the promotion of the following part of the Bill—viz., clause 11—the marginal note whereof is 'Application of Gas-Works and Water-Works Funds, Repeal of Certain Sections of the Acts of 1867 and 1875.'" Alderman Neil seconded the motion. Scarcely had he done so, however, when there were loud cries for "more information." Everybody appeared anxious to speak at once; and an attempt was made to adjourn the proceedings. The appeals of the Mayor for order were scarcely audible. When at last he did get a hearing, he asked the meeting to give every speaker a fair chance of putting forward his views.

Mr. J. White expressed the opinion that if, the Bill was passed, the price of gas would be raised. He said he would absolutely refuse to allow the Council to handle the gas and water profits. Under the existing conditions, cheap gas had been of the greatest importance to the ratepayers of the town. Although a property-owner, he deprecated any change in the system, and he begged that more consideration should be given to the prepayment meter consumers. Mr. Lewis (a member of the Council) spoke strongly in favour of the new Bill, and asked the burgesses, as consumers, to see that their representatives managed the gas and water undertakings in the best possible way. It was claimed that these valuable properties were the possessions of the Mayor, aldermen, and burgesses of Widnes, and that they should be worked absolutely and entirely on behalf of the consumers without reference to the burgesses at all. [A Voice: That's right.] He contended that it was not right. How had it worked out in the past in relation to the ordinary consumer? The number of consumers in Widnes, he understood, was 6596, and it would be seen at a glance that the great body of burgesses were consumers. It was costing between 11d. and 1s. to make 1000 cubic feet of gas this year; and the ordinary consumer was charged 1s. 3d. if he paid in a month, while the possessor of a slot-meter got 44 cubic feet for 1d. The consumer of over 3 million cubic feet had it at 1s. 1d., and for motive power at 11d., per 1000 feet. The average price was only just a small fraction over cost. He claimed that the policy of supplying manufacturers with cheap gas should not be interfered with; but he thought the Council should have discretionary powers to deal with any surplus profits. A large number of burgesses and gas consumers in the town wanted something more than cheap gas. To say that these profits would go to the benefit of the landlord was false, and was nothing more than a "catch" phrase, by which he hoped the electors would not be deceived. Alderman Neil appealed to those present to approve of the Bill, and not to be "gulled" by a huge advertisement and leaflet which had been issued. Some of the Alderman's remarks gave rise to considerable uproar.

The next speaker was Alderman Timmis, the Chairman of the Gas and Water Committee, who met with a good deal of interruption. On Alderman Neil appealing to the meeting to give the speaker a fair hearing, Alderman Timmis succeeded in declaring his opposition to the Bill; pointing out that under the old Act the Corporation had been in a position to reduce the price of gas to everyone in the town, and that every householder had been able to have gas. He denied that gas was now, or ever had been, sold below cost price. He concluded by asking the ratepayers whether they would have the old Act, under which they had prospered, or a new one with an unknown future before it. Mr. Boyle, a Labour member of the Council, contended in an emphatic speech that the gas and water profits should be put in the hands of the whole community, and not in those of a section of it. The Gas Committee wished to tie up this money so that the burgesses could not ask for a penny. He condemned the quality of the gas, which he declared was ruining the health of the people. He appealed to the meeting not to allow themselves to be "gulled," and have their birthright taken from them by the capitalists. Mr. Davies (another councillor), who was repeatedly interrupted, quoted figures to show that for motive power gas was sold at a lower figure than it cost to make it. He also dealt with the charge for water, and said three firms were getting their supply at 2d. per 1000 gallons, while 61 firms who bought it by meter paid 4½d. per 1000 gallons, so that the three might have it at the lower rate. Alderman Gossage, in opposing the clause, said Mr. Davies forgot to mention the fact that the three firms referred to had their water at the price named because they took 50 million gallons.

Several other speakers having addressed the meeting, the resolution approving of the clause was rejected, in the midst of much uproar, by an overwhelming majority. The result was announced amid tumultuous cheering.

At the meeting of the General Purposes Committee of the Town Council the following day, it was decided to recommend the Council to take a poll of the electors on the subject of the promotion of the Bill. An intimation to this effect appeared on the *agenda* for to-day's meeting.

The Need for Perfect Gas-Fittings.—"The evidence in the case shows how important it is that gas-fittings should be perfect," said the Liverpool City Coroner at an inquest on the body of a master carter named Quinn (aged 30 years), who was found unconscious in his hut office at Nelson dock. He lit the gas; but owing to the meter freezing, it subsequently went out. An employee then thawed the meter with hot water; and on returning two hours later there was a strong smell of gas and deceased was insensible. The evidence failed to make clear whether the escape of gas had issued from the two jets which may not have been turned off when the gas went out, or from a pipe formerly attached to a gas-stove which had been ineffectually "knocked-up" when the stove was removed twelve months ago. The Coroner asked what percentage of water gas was supplied to the district, seeing that the fatal effects of the escape had been so rapid upon deceased. Mr. Edward Allen, the Engineer to the Gas Company, replied that the admixture was not exceptional. He was inclined to think it was below the ordinary 15 per cent. Dr. Armstrong, who made a post-mortem examination, said the condition of the body pointed to coal-gas poisoning. The Jury found that deceased died from gas poisoning, caused by imperfect fittings.

CANDLE POWER OF MANCHESTER GAS.

The first meeting of the Manchester City Council for the present year was taken advantage of by Alderman Gibson, the Chairman of the Gas Committee, to reply in his accustomed vigorous style to some strictures which had been passed by Mr. Norbury Williams, the Citizens' Auditor, on the quality of the gas.

Mr. Norbury Williams had, said Alderman Gibson, given a return of the candle power of the gas for the years from 1899 to 1906; but he left out the year 1907. In 1906, the candle power was 15·60; but in 1907 it was 17·67. He (Alderman Gibson) had been surprised to find that in 1906 it was so low; and he had said that under no circumstances must the power be less than 17 candles. The result was the increase in 1907. Some time ago he stated that the Manchester gas was as good as it ever was, and that probably the incandescent system had something to do with people imagining that their gas was not so good as formerly. What he said then, he said now. At present the power was 18 candles; so that it was perfectly true to say that the illuminating power of the Manchester gas was never higher, and the gas never better in quality, than to-day. Nothing was charged to the consumers for meters or for cookers; and in these and other ways £50,000 or £60,000 a year was put into the consumers' pockets. There was no body of consumers in the kingdom who had more cause to be thankful to their Gas Committee than had those of Manchester.

At the same meeting, the Council, on the recommendation of the Gas Committee, agreed to accept tenders in connection with an installation of inclined retorts at the Gaythorn works.

THE QUALITY OF DUBLIN GAS.

During the past week, there has been some further discussion in Dublin with regard to the quality of the gas sent out while the Company were hampered by the strike among their workmen. As recorded last week, the gas had been reported to contain sulphuretted hydrogen and carbonic acid, and to be deficient in illuminating power.

At the meeting of the Corporation, Mr. Daly asked what was being done in connection with the matter. The reply was that the Law Agent had already been instructed to prosecute the Company. A touch of humour was added to the proceedings when Dr. M'Walter said he had noticed recently a perfect epidemic of a low kind of fever with headache, which seemed to be due to the extra poisonous character of the gas supplied; and Alderman Kelly interjected: "Or Christmas times." On this, Dr. M'Walter retorted that it was useless to stand up in the Corporation, for the Gas Company had influence with many gentlemen; and though the statement was subsequently withdrawn, it was not allowed to pass unnoticed by Alderman Cotton, who pointed out that not a single member of the Corporation held a share in the Gas Company.

When the Lighting Committee held the special meeting last Friday week which had been decided upon, to consider the complaints that had been received, the City Gas Examiner (Mr. T. J. Cotton) reported that since the 1st inst. the injurious impurities previously referred to had been almost absent from the gas; but the illuminating power still remained exceedingly low. He pointed out that this falling off had come just at a time when the Gas Company had increased the price of gas to 3s. 7d. per 1000 cubic feet in the city, and 4s. 6d. in the added areas. The Committee instructed him to calculate and report on the loss resulting from the poor gas supplied to the public lamps.

A CRITICISM OF THE WATER-SLIDE CHANDELIER.

A writer in the "Newcastle Daily Chronicle" makes the following less complimentary than justifiable remarks on that not unusual source of accident, the water-slide chandelier: "In view of the recent serious gas explosions in this district through defective water-slide chandeliers, I should like to draw attention to a note which has been sent out on the matter by the Newcastle Gas Company. It says that this type of gas-fitting is obsolete, unnecessary, and a source of danger unless the water is frequently renewed; and that therefore customers are strongly recommended either to substitute modern pendants, or have the sliding arrangement converted into a fixture. The water-slide chandelier is generally an elaborate piece of brass-work, intended, like the goods in a bazaar, to be both useful and ornamental; but it is a relic of mid-Victorian days that might well be dispensed with, along with anti-macassars and baskets of wax flowers. I once heard a plumber say that the best use that was ever made of one was by a miner's wife, who, not having any gas in her house, utilized the chandelier to decorate her window. It stood in all its glory on a little table in front of the window; and the point was that it was expressly bought because it was 'genteel,' and would make the neighbours envious."

Public Lighting of Merthyr.—The Public Works Committee of the Merthyr Town Council have decided to substitute electric lighting by Osram lamps for gas in the main road from Swan Street, Merthyr, to the New Road, Dowlais. The Board of Trade informed the Council that they were advised there was no danger to be apprehended from an overhead main for street lighting purposes conveying a continuous current; and the Council agreed to allow the Merthyr Electric Traction Company to carry the current by an overhead main. It was stated that the present cost of lighting the road from Swan Street to the Bush Hotel, Dowlais, by gas and electricity, was £364 10s.; and the new system, which would provide for double the number of lamps, would cost only £321.

WOLSTANTON COUNCIL'S GAS ARBITRATIONS.

The recent arbitrations in connection with the Wolstanton gas undertaking were the subject of a large part of the proceedings at the last monthly meeting of the Urban District Council.

The minutes of the Gas Committee stated that at a meeting on Nov. 26, a letter was read from the Town Clerk of Burslem inquiring whether the Council would be disposed to make any offer for settlement of the gas dispute; and the Council replied that the only offer they could make was the sum found by the Arbitrator to be the price of the mains, pipes, and other works—namely, £9357. On Dec. 19, the Clerk (Mr. E. Hollinshead) reported to the Committee the results of the arbitration proceedings between Newcastle and Wolstanton, in which case the sum of £6580 was awarded for mains, pipes, &c.; and also the special case between the Burslem Corporation and the Council, before Mr. Justice Bray, who decided on all points in favour of Wolstanton, and ordered that the sum of £9357 should be paid by the Council for mains, pipes, &c., and nothing for goodwill. He also reported that the Town Clerk of Burslem had informed him that the Burslem Gas Committee had decided not to proceed further with their claim for severance and loss of revenue. At a subsequent meeting of the Gas Committee, a letter was read from the Clerk, with reference to his remuneration and office expenses in connection with the parliamentary and arbitration proceedings over the Wolstanton Gas Act, 1906. It was unanimously resolved that the Clerk be granted the sum of £315, to cover the special services rendered by him and his office expenses; and the thanks of the Committee were tendered to him for the assiduous attention he had given to the matter, which had so much conduced to its successful issue.

Mr. J. H. Wolliscroft, in moving the confirmation of these minutes, said the Gas Committee desired every member of the Council, and the ratepayers, to be made as fully acquainted as possible with the details of the arbitrations. When the Bill giving the Council power to supply gas in their own area was first promoted, complaint was made that the matter had not been made public enough. Perhaps there was ground the awards had been made, the Committee were confident that the more for complaint at the time; but now, at the first Council meeting after fully the ratepayers were acquainted with the details of the arbitration, the better pleased they would be with the awards. They would notice in the minutes that Newcastle were awarded £6580 for the mains, pipes, and other works of the Corporation within the area of the Wolstanton Council. This was £1080 more than the Council offered them; but Newcastle claimed £36,866, and they were awarded only £6580. The arbitration in this instance differed from that with Burslem. In the case of Newcastle, both parties agreed to accept the Umpire's decision as final. Newcastle's claim was stated under six different heads. One was for mains, pipes, services, &c., in the Wolstanton area, amounting to £7469; and this was the only one of six claims put forward which they admitted Newcastle were entitled to under the Gas Act of 1906. But while they admitted the claim, they said it was too much. One item of £4338 was for decreased value of works through taking away Wolstanton's supply; another for increased cost of working expenses capitalized at £3965. For goodwill, they asked £12,596, and for extra size of mains in the Newcastle area £692; and they even requested the Umpire to award them £4455, the capitalized value of the interest and sinking fund yet to be repaid. To finish up with, they modestly asked for 10 per cent. on all these items, because they were compelled to sell by Act of Parliament. He quite thought they would all agree that the Council were perfectly justified in contesting such a preposterous and ridiculous claim; and the award went to prove that they were right. Coming to the arbitration with Burslem, the claim in this case was under three heads: Payment for mains, pipes, &c.; compensation for severance; and goodwill. At the same time, Burslem stated that they refused to accept the Umpire's decision as final in two out of the three claims put before him. They only asked him to define the amounts to be paid by Wolstanton to Burslem providing the High Court, to which they intended to carry the case, decided in favour of Burslem. Here, again, the Council admitted that Burslem were entitled to something for mains, pipes, &c., but they did not admit the other two items. For the mains, pipes, &c., Burslem claimed £11,388, and also 10 per cent. for compulsory sale, or a total sum of £12,527. For severance they claimed £1752, and for goodwill £18,684—making a grand total of £32,963. The Umpire gave the awards under three heads, as asked for, as follows: For mains, &c., £9357 (£12,527 claimed); for severance, £893 (£1752 claimed); and for goodwill, £11,124 (£18,684 claimed)—making a difference in favour of Wolstanton, even if Burslem had been entitled to claim, of £11,589. The case came before the High Court on Dec. 5; and the decision of the Judge was that Burslem were only entitled to the sum awarded for pipes and fittings. In other words, Wolstanton won all along the line. Mr. J. D. Fitzgerald, K.C., the leading Counsel for Burslem, speaking in opposition to the Bill in the House of Commons on July 6, 1906, pointed out that if it passed in its then form Burslem would get nothing beyond the actual cost of mains and pipes. The Bill passed through both Houses without alteration; and Burslem had got nothing, as was predicted by their own Counsel. Whether in the face of such a strong expression of opinion, Burslem were justified in carrying the case to the High Court, he must leave those present to judge. Wolstanton had tried to settle the matter amicably with Burslem and Newcastle; and he personally had accompanied two Sub-Committees to meet them. But a settlement could not be effected without admitting the claims for severance and goodwill; and this they could not do. The total amount claimed by both Corporations was £69,829; and the sum awarded was £15,937—a difference in favour of Wolstanton of no less than £53,892. With this grand result they had every reason to be perfectly satisfied; and out of nearly £54,000 which had been saved, they would be able to pay the costs of the arbitration, which they were compelled to do by law. There was one thing, perhaps, they had noticed; and this was the difference in the amounts claimed by Newcastle and Burslem. While Burslem, according to the evidence given in the House of Commons, were supplying double the quantity of gas in their area that Newcastle were, the latter put in a claim for £4000 more than Burslem, and were

awarded £2777 less. The Council had not attained their object without a great amount of work and expense on the part of the Clerk; and as his salary did not allow for the extra work and out-of-pocket expenses, the Committee unanimously decided to grant him the sum mentioned, which, while not compensating him fully for the services and expenses incurred during the long period the litigation had been going on, yet would do something towards it; and the Committee tendered him their thanks for the assiduous attention he gave to the matter.

After congratulatory speeches on the part of various members, the minutes were adopted unanimously; and a letter was then read from Mr. Corbet Woodall, in which he expressed the opinion that the behaviour of the Council had been admirable throughout opposition which was the most severe he had ever met with. He added, with regard to the scheme itself, the belief that, notwithstanding the burden which had been put upon the gas undertaking, it would work out satisfactorily in the interests of the ratepayers and the consumers. Thereafter the seal was affixed to a mortgage between the Council and the Liverpool Victoria Legal Friendly Society, for the sum of £7000 on account of the gas loan, and also to a similar deed between the same parties to cover the sums awarded by the Umpire to Burslem and Newcastle, together with the taxed costs in each case.

OLD EMPLOYEES AT BIRMINGHAM.

In the absence of Alderman Sir Hallewell Rogers, the report of the Gas Committee was presented by Alderman Bishop at last week's meeting of the Birmingham City Council.

As appeared from the brief notice which was contained in the "JOURNAL" for the 31st ult. (p. 992), the report was of a satisfactory nature. Alderman Bishop pointed out that during the past year there had been a considerable increase in the price of coal. The effect was that they had had to pay £50,000 more for their coal; but notwithstanding this, the Committee had resolved not to raise the price of gas. This was because they had been able to get better prices for some of their residuals, and because great care had been exercised in manufacture and management. The amount of gas sold for the six months ended Sept. 30 was very satisfactory, as it was an increase of 6¼ per cent. compared with the corresponding period of the previous year. This increase was largely the result of the number of cooking-stoves issued the last five years; and the Committee were well satisfied with the result.

A member subsequently called attention to a persistent rumour in the neighbourhood of the Windsor Street and Nechells works that a considerable number of old employees had been discharged because of the near approach of the period when they were entitled to pension. He asked whether there was any truth in the report. Alderman Bishop, in reply, said there was absolutely no truth in it. The fact was there was no department of the Corporation—and certainly very few private firms—that employed such a number of old men. The ages of those recently pensioned were 66, 54, 62, 58, 54, and 72. In fact, the department were reluctant to part with their old employees; and it often happened that men did not like being superannuated, and if they were capable they were kept on. It was true that some men had been discharged; but this was owing to the use of certain machinery which necessitated the employment of a smaller number of men. There might be some old men among these; he could not say. The whole history of the Committee showed the rumour to be absolutely untrue.

GAS AFFAIRS AT DEVONPORT.

The Proposed Increase in Price—The Water-Gas Plant.

At the Meeting of the Devonport Town Council last Thursday, considerable discussion took place respecting the affairs of the Gas Committee. The Committee reported that they had received the report of the fact that the question of the increase in the price of gas was referred back to them at the last meeting of the Council. Mr. Tozer inquired why the gas was of such poor quality, why it gave off such offensive smells, and whether or not the carburetted water-gas system was a success. Mr. Daymond, the only member who voted for the Committee's recommendation to increase the price of gas, asked whether it was the intention of the Committee to bring up another report on this subject. After a good deal of talk as to whether these questions were in order, Alderman P. C. Goodman said that at the last meeting 55 out of 60 members voted in favour of a certain minute being sent back to the Committee for further consideration. Surely they were in order in asking if it had had any further consideration, and what was the result of it. They read in the newspapers a statement to the effect that at the last meeting of the Gas Committee the Chairman said that neither he nor the Committee were responsible for the proposal to increase the price of gas, but that the Engineer (Mr. J. W. Buckley) was. This did not agree with what was said at the last meeting, when they were told that the recommendation was unanimously passed by the Committee; nor did it agree with the facts. If the Gas Engineer was responsible for the proposal to increase the price of gas, he was also responsible for the advice that a contract should be entered into for the supply of coal for a term of years at a time when coal was cheap—advice which was not taken. It was the Gas Committee who were responsible, and they could not shirk the responsibility.

The Chairman of the Committee (Alderman Hornbrook), replying to Mr. Tozer's questions, said that there was no serious complaint as to the quality of the gas, though, as was always the case after severe frost, there were a certain number of complaints of an individual character. The fact was that last month 282 complaints were received from consumers and investigated, against 361 in December, 1906. As to the carburetted water gas, he had never risen with greater confidence or more satisfaction to reply to a question than he now did. His answer was that they were perfectly satisfied. They had no complaints at all respecting the working of the plant. Numerous complaints as to nuisance were received from residents near the gas-works before the plant was put in; but since then there had been none, and the Engineer had been complimented by people on the freedom from nuisance. With regard to the price of gas, the Engineer, and he alone, was responsible for what happened. He told them that in the majority of the large towns the price of gas had been raised; and he said that if they did not do the same, they would find themselves some thousands of pounds short at the end of the year. He told the Engineer that it was absolutely against his policy; but when it was submitted to the Committee, they were unanimous in recommending that it should be brought before the Council. He was glad they took this course, because it freed the Committee from the responsibility that would otherwise have attached to them at the end of the year. Now the Council had taken the responsibility upon themselves. In their recommendation, the Committee followed the example of the large towns, a list of which they submitted; but the Council sent the recommendation back, and told them to use up their reserve fund. They were not going to do this. They did not want to touch the fund, lest, if anything happened, they would have to fall upon the rates; but coal was costing a sum equal to 4d. per 1000 cubic feet of gas more than it did this time last year, and someone had to make this up. The proper thing to do was to follow the Engineer's advice and increase the price. The Council had seen fit to take another course; and the responsibility must rest upon them for any consequences that ensued.

DROITWICH GAS UNDERTAKING.

Unpleasant Disclosures in Connection with the Management.

The Droitwich Town Council held a special meeting on Monday last week to receive a report from Mr. Hubert Leicester, the Borough Auditor, and Mr. Alfred Slater, the Elective Auditor, on the subject of certain irregularities which had come to light in connection with the collection of money from the prepayment meters, the consequence of which had been the dismissal of the Gas Manager. The report showed that, according to the readings of the slot meters for the half year ending the 30th of September last (as recorded on a visit in November), in many cases the cash taken from the boxes on that occasion was considerably short of the amount recorded as consumed since the previous visit. On inquiry of the collector, information was obtained that he had not personally checked the meter readings, and therefore could not say whether the previous records were correct, or whether inaccurate figures had been placed in the meter-book by the late Manager. The report contained a statement of gas used by a number of consumers; and it showed that the difference between the value of the gas burnt and the money received was £19 3s. 8d. There was also in the cash sales a balance against the late Manager of £1 14s. 9d. There was also a quarter's rent due at Michaelmas, amounting to £2 10s. These three items came to £23 8s. 5d.; and there was a further deficiency on sales of £2 19s. 2d. Mr. Alfred Bird (of Bromsgrove), who has lately been in charge of the works, reported that in his opinion the Council had up-to-date and compact plant for the size of the works. He was sorry to state, however, that the retorts had been very much neglected. They had only just sufficient to carry them through the winter, owing to the large ones not being renewed in the summer. A great saving could be made in the working of the retorts, and he would be glad to explain how it could be done. The sulphate of ammonia plant now required repairs, as it had been allowed to get into a very bad state, and the results realized in the past year were very bad. With proper working, there would have been from 9 to 10 tons more sulphate produced. With regard to the production of gas, there appeared to be a deficiency of 55 tons of coal, owing to more being carbonized than was entered in the books. There should also have been a larger quantity of coke sold per ton of coal. He found on the 31st of March last that there were 4 tons of sulphate of ammonia in stock; but from the sales he could only trace 2 tons 7 cwt. 3 qrs. From what he had noticed, he considered there should be a stricter supervision of the yard sales. The public lamps appeared to burn a larger quantity of gas than they should do. Alderman Holyoake said the public were aware that there had been far more serious matters known to the Council before they dismissed the late Manager than those disclosed by Mr. Bird's report. The Council then proceeded to interview four out of 79 applicants for the post of Manager; and they ultimately selected Mr. Shewering, of Hereford.

GAS LIGHTING IN NEWCASTLE NINETY YEARS AGO.

A correspondent sent to the "Newcastle Daily Chronicle" last Friday some interesting particulars on the subject of the gas supply of Newcastle in 1818; and his communication, which was as follows, appeared next day.

If you refer to Sykes's Local Records, under date of Jan. 10, 1818, you will find that it is exactly 90 years to-day [Friday] since gas was first supplied to consumers in Newcastle. The gas-works of that day were situate at the Manors, immediately behind the present Manors Station, and just within the site of the old Town Wall, and close to the Austin Tower. Herewith is a reproduction of the original advertisement for the "Gas Lights;" and I do not think gas shows any signs of decadence, seeing that in the week ended Dec. 20 last over 100 million cubic feet of gas were delivered out of the holders—a record performance for the local Company, the previous record being held by the same week in 1901, which was an abnormally cold week, and at the top of an industrial boom on Tyneside.

GAS LIGHTS.

The proprietors of the Newcastle Fire Office respectfully acquaint the public that, having made considerable progress in the necessary preparations for supplying the town with light from carburetted hydrogen gas, they are ready to treat with the occupiers of shops, houses, manufactories, ware-

houses, counting-houses, and other public and private buildings, for lighting their premises with gas, on the terms stated in the following scale of charges per annum for burners of various sizes, estimated upon a flame of 2 inches in length to each burner :—

Burner.	Eight o'clock.	Nine o'clock.	Ten o'clock.	Twelve o'clock.
Cockspur—				
1 jet . .	£0 10 6	£0 13 0	£0 15 0	£0 19 0
2 jets .	0 15 0	1 0 0	1 5 0	1 15 0
3 ,, .	1 1 0	1 10 0	1 15 0	2 5 0
Argand—				
No. 1 .	1 11 6	2 0 0	2 10 0	3 0 0
No. 2 .	2 2 0	2 10 0	3 0 0	4 4 0
No. 3 .	3 3 0	3 15 0	4 4 0	5 0 0
Batswing . .	1 11 6	2 0 0	2 10 0	3 0 0

Cockspurs, all night—

1 jet	£1 7 6
2 jets	2 10 0
3 ,, ...	3 0 0

Innkeepers and others whose hours of lighting are uncertain, may be accommodated by special agreement with the Company.

Printed instructions for lighting up and extinguishing the light will be given at the time of contracting. The Company will keep an assortment of ornamental lamps, with suitable burners, and will supply them at their original cost.

No extra charge will be made if the light be extinguished in a quarter-of-an-hour after the time contracted for; but on Saturday nights the lights may continue burning till twelve o'clock if required.

None can contract for less than one year, and the rents will be collected quarterly in the following proportions: Two-thirds of the rent at the two winter quarters, and the remaining third at the two summer quarters.

Where the occupiers of three adjoining houses or shops unite in contracting, the proprietors will be at the charge of laying a branch pipe from the main pipes to the threshold of the centre house or shop. In other cases the occupiers will be required to pay the expense of their respective branch pipes; and in all cases the proprietors must be permitted to superintend the laying of the branch and communicating pipes, that they may be properly done.

Fire Office, Newcastle, Nov. 15, 1817.

PROPOSED WATER COMPANY FOR BUNGAY.

Councillors Alarmed by the Bude Promotion.

A short time ago, the Wangford District Council were approached by Messrs. Preston and Perryn, who are known as promoters of various gas and water undertakings, and who had the support of Mr. H. Hartcup, a local Solicitor, with a proposal to start water-works for the supply of Bungay, if the Council would allow the scheme to be carried out without going through the formality of obtaining a Provisional Order to sanction it. Several questions were put to the promoters by a Committee appointed by the Council to consider the proposal—one being as to the reason for the wish to dispense with a Provisional Order. The reply was that an Order would not give them sufficient capital to carry out the scheme adequately. The Council decided to lay the matter before the two Parish Councils, so as to obtain the views of the townspeople thereon before going any further. This was done by means of the following resolution: "That these Councils recognize the necessity for a good water supply, and recommend that the offer of Messrs. Preston and Co. be accepted." It appears that subsequently Mr. Hartcup's attention was called to some statements recently published by the "Financial News," and noticed in our columns, in connection with the promotion of the Bude Gas Company; and at the meeting of the Parish Councils on the 3rd inst., when the matter was before them, he stated that he had asked Messrs. Preston and Perryn to attend to answer any questions and offer any explanations that might be considered necessary. The statements referred to were asserted to be due solely to personal bias. Several questions were put, and certain of the statements read; but Mr. Hartcup appeared to think that, at the worst, the Bude prospectus had only presented the affair in rather rosy colours. Mr. Preston explained that the Bungay Company would not be run by the Finance and Construction Company, Limited, who, as our readers are aware, are at the back of that Company. In the result, one Council voted in favour of accepting the proposal, and the other against doing so—in each case by the casting vote of the Chairman. On Monday last week, the District Council held a meeting to receive the report of the Parish Councils. Mr. Hartcup was in attendance, and requested to be allowed to address the Council. In the course of his remarks, he asked whether they would give provisional consent to the scheme, on his assurance that the proposed Company would apply for an Act to enable them to carry it out. This appeared to be so strange a change of attitude on the part of the promoters—seeing that they had previously stated that a Provisional Order would be too costly, and would not give them sufficient capital—that the Council decided that any Company who desired to carry on operations in the district must first obtain the necessary powers, either by Provisional Order or by Act of Parliament. Here the matter rests; and, at all events for the present, Bungay has not been captured by the company promoter.

Increase in Price at Wallsend.—On the Improvement Committee reporting to the Wallsend Town Council that the Gas Company had given notice that the price of gas, as and from Jan. 1, would be increased from 2s. 3d. to 2s. 6d. per 1000 cubic feet, it was decided to write to the Company expressing the disapproval of the Council at the proposed rise.

Proposed Gas-Works Purchase at Lisburn.—The Lisburn Urban District Council have, on the suggestion of a Special Committee who have considered the matter, decided to obtain the services of an expert who will advise them as to the cost of erecting new gas-works and of manufacturing gas, and the most suitable site for the purpose, in the event of the Council being unable to come to terms with the local Gas Company for the purchase of their undertaking.

HUDDERSFIELD COMPENSATION-WATER BILL.

Public Meeting of Electors Unnecessary.

The Huddersfield Corporation are promoting a Bill to enable them to give a day as well as a night supply of water to manufacturers having compensation water rights in the Colne Valley from the streams in the Wessenden watershed; and meetings of the Town Council and of the ratepayers were duly fixed for last week to consider the matter, in accordance with the terms of the Borough Funds Acts. At the last moment, however, the representatives of the millowners wrote pointing out that where the funds of the borough were not proposed to be utilized for the purpose of such promotion, it was not necessary to hold these statutory meetings. They added that, as the Bill in question was to be paid for by the parties interested in the compensation water, and no part of the cost was intended to come out of the funds of the borough, the simplest form in which to deal with the question of finance would be by the millowners paying a sufficient sum of money into a bank to the credit of the Corporation, and under their entire control, for the purpose of defraying the expenses of the promotion. This they accordingly did; and subsequently the General Purposes Committee passed a resolution that the Mayor had no option under the circumstances but to countermand the Council meeting and the electors' meeting.

The position of affairs was then explained in the following communication which the Town Clerk (Mr. J. H. Field) made to the Press: The original intention was that the Corporation should pay the expenses of the promotion of the Bill as the measure proceeded, and that the mill-occupiers should reimburse the Corporation the amount of the costs as soon as it became law. Under this arrangement, as the borough fund would be charged temporarily with the payment of the expenses, it would be necessary, under the Borough Funds Acts, that the electors should be consulted as to the promotion of the Bill at a public meeting; and this was the understanding at the time the Mayor issued the notice for the meeting. The legal position had, however, been since entirely altered by the arrangement evidenced by the letter from the millowners' representatives, under which £500 had been paid into a bank to the credit of the Corporation, for the purpose of defraying the expenses of the Bill; so that there would be no recourse whatever to the borough fund. Under these circumstances, the Borough Funds Acts did not apply.

SKEGNESS WATER PURCHASE BILL.

The Skegness Urban District Council are promoting a Bill which, among other things, is to provide for the acquisition of the undertaking of the Skegness Water Company, and to confer authority to supply water within stated limits. The power is being sought in accordance with a three years' purchase clause which was, at the instance of the Council, inserted in an Act secured by the Company in 1905 to enable them to furnish a fresh supply of water. At a meeting of the ratepayers last Tuesday the Bill was approved. The works which have supplied the town since 1879 belong to the Earl of Scarborough; but the objection of visitors and residents to the saline properties of the water led to the new scheme being promoted by the Company.

In the course of the meeting, Mr. J. Barlow, the Chairman of the Council, who presided, remarked that the importance of the management of the water supply being in the hands of the town, and not in those of a private Company, could not be over-estimated. The complaints of visitors as to the taste and quality of the water had militated somewhat against the progress of the town. If a private Company once got the monopoly of supplying water, it would be difficult for the town to acquire the same, except upon ruinous terms. If a Company owned the works, all the profits would go to the shareholders; but if the town had the concern in their own hands, it would be to their interest to keep down the charges.

The Engineer (Mr. W. H. Radford) said the Company found, on putting a borehole down at Welton, where the new water was derived from, that 120,000 gallons came without pumping, and 500,000 gallons could be pumped out every day incessantly. As the daily supply required for Skegness varied from 90,000 gallons in the winter to 300,000 gallons on the busiest day in summer, there was an ample supply. Next to quantity came quality; and the chief objection to the Skegness water was the salt it contained—namely, 100 parts out of every 70,000 parts. In the same quantity of Welton water there were only 2¾ parts of salt. The undertaking, if acquired by the Council, would not show a large immediate profit; but this was not to be expected. The annual cost for working would be very little more for double the present population; and with the town increasing yearly, the cost would annually become less and less to each ratepayer.

Reinstatement of Roads in Hammersmith.—The Works Committee of the Hammersmith Borough Council have had under consideration a proposal by the Metropolitan Water Board that the Council should undertake the work of reinstating, at an agreed schedule of prices, the surface of roads broken up by the Board. A draft agreement which had been prepared provided that the Council should take work in hand within 24 hours after receiving notice from the Board that trenches were to be filled up, or within 48 hours if the notice was received on Saturday or Sunday. The Committee recommended the Council, at last Wednesday's meeting, to enter into the agreement, on condition that "three clear working days" should be substituted for "24 and 48 hours" in regard to the time at which the Council should begin the reinstatement; and they submitted the following schedule of prices: Macadam, per superficial yard, 3s. 10d.; flints, 3s. 4d.; gravel, 1s.; Jarrah wood, £1; deal, 14s. 6d.; beech, £1; 2-inch asphalt on 6-inch concrete, 15s.; granite setts on 6-inch concrete, 10s. 6d.; York stone, new, 9s. 9d.; do. relay, 1s. 8d.; composite stone, 6s. 9d.; do. relay, 1s. 8d.; 1-inch asphalt, 7s. 6d.; tar paving, 3s. 4d.; kerb relay, per yard, 6d.; channel relay on 6-inch concrete, per yard, 1s. 6d.; concrete, per cubic yard, 13s. 6d. The recommendation was adopted.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In Glasgow to-night the experiment was tried by the Western District Section of the Scottish Junior Gas Association of devoting an evening to subjects not of a technical nature, but closely associated with the working of gas undertakings. Mr. W. M. Mason, the former Secretary of the District, opened with a paper on "Advertising," in which he succeeded in laying before the members a mass of information, both literary and pictorial, on the benefits of adequate advertising, which most gas managers had hitherto somewhat neglected. The second paper, on "Traffic in Gas-Works," by Mr. W. Straiton, could not have been in better hands, as the author is Traffic Manager in the Provan Gas-Works. He gave a very clear description of how the immense traffic of that huge establishment is got through. A very interesting part of his communication was the description of the method of bringing the right end of the coal-waggon to the tipping place. Both papers were well discussed; and the feeling of the members was that the meeting had been in all respects a success. The presentation to Mr. George Braidwood, the Hon. Secretary, of a number of standard works on gas manufacture, was a pleasing act of recognition of the services he has rendered to the Association for three years—services which are at all times rendered ungrudgingly, and are invariably found to be of the most thorough order.

In the Glasgow Town Council this week, Mr. Dallas asked the Convener of the Gas Committee if, having regard to the fact that the charges for office management in the Gas Department had increased from £10,890 in 1902 to £14,073 in 1907, equal to 30 per cent., while the gas production had increased by only 15 per cent., the Committee would institute an inquiry into the cause, and submit a report to the Corporation. Mr. Paxton, in the absence of the Convener, replied that the increase was caused in a great measure by the enormous number of automatic meters, of which 30,000 had now to be dealt with. The meters required a great deal of attention, and therefore more hands were needed. As a matter of fact, there were 27,176 more automatic meters now than in 1902. Of course, the ordinary gas business had also increased. Bailie Russell asked how many men were employed in attending to these meters. Mr. Paxton promised to bring the whole matter before the Committee and report.

It is reported that the Gas Committee of the Falkirk Town Council have agreed to recommend that the retort power in the gas-works be increased by 50 per cent. This is proposed to be done by placing twelve retorts in ovens in which there are now only eight. No additional buildings will be required; and the new retorts can be added at comparatively small cost, as the method proposed obviates the necessity of extending the retort-bench.

In the Kilmarnock Town Council this week, the Gas Committee reported that they had agreed, owing to the great demand for coke, to discontinue its free distribution among the workmen at the gas-works this year.

In a report of the monthly meeting of the Newport (Fife) Town Council this week, it is stated that "in compliance with the suggestion made by Bailie Forrest some time ago, the Gas Manager's report was very specific, containing information about the amount of coal consumed, gas produced, coal in stock, and many other details, which the Convener had had put in the shape of a printed form. The average quality of the gas during the month ending the 14th ult., was 20·95 candles."

The fashion of having week-end residences, which are closed for the greater part of the year, is not without its dangers. Two incidents which happened this week illustrate this fact. In one a tramp entered a house which was standing empty in Coatbridge, intending to take shelter in it for the night. He lighted a match, and there was an explosion of gas. Probably some previous free tenant had left a gas-tap turned on when he quitted the place on the return of daylight. At all events, a good deal of damage was done in the house, and the man was so severely burnt that it was necessary to remove him to the hospital. In the other case, the water-pipes in an empty house in Prestwich were burst by the frost, and when a thaw came the place was flooded.

CURRENT SALES OF GAS PRODUCTS.

Sulphate of Ammonia.

LIVERPOOL, *Jan.* 11.

The large makes are being delivered against contracts made in advance; but there has been a fair amount of buying of the smaller makes at slightly hardening prices. The buying has, however, been mainly for covering purposes; fresh orders from abroad being still rather scarce. The closing prices are £11 16s. 3d. per ton f.o.b. Hull, £11 18s. 9d. per ton f.o.b. Liverpool, and £12 per ton f.o.b. Leith. There has also been inquiry for delivery over the spring months; but the views of buyers are not above spot values, while makers are not concerned to make further sales unless at a premium of 2s. 6d. to 5s. per ton, according to position. Consequently no important business has transpired.

Nitrate of Soda.

This article remains quiet at 11s. 1½d. per cwt. for 95 per cent., and 11s. 4½d. for refined quality, on spot.

Tar Products.

LONDON, *Jan.* 13.

The markets are still very depressed, and there are at present no signs of any improvement. Pitch remains unchanged all round, with the exception of west coast ports, which are fetching about 3d. per ton more than recent prices quoted. Creosote is steady, and the figures remain unchanged. Some small lots have been done at normal prices. Benzols are unaltered; while toluol is without interest. Solvent 90-160 and 90-190 are quiet, and business seems only possible at reduced prices. Carbolic acid is still being sold at from 1s. 6¾d. to 1s. 7d. per gallon. Tar is being taken at very low figures.

The average values during the week were: Tar, 13s. to 17s. *ex* works. Pitch, London, 22s. to 22s. 6d.; east coast, 20s. to 21s.; west coast, 19s. 9d. to 20s. 9d.; Benzol, 90 per cent., casks included, North 8d. to 8¼d, London 8¾d.; 50-90 per cent., casks included, North and London, 8d. to 8½d. Toluol, casks included, North 9d. to 9⅜d., London 9½d. to 10d. Crude naphtha, in bulk, North 3½d. to 3¾d., London 3¾d. to 4d.; solvent naphtha, casks included, North 10d. to 10½d., London 11d. to 11½d.; heavy naphtha, casks included, North 10½d. to 11d., London 11½d. to 1s. Creosote, in bulk, London 2½d. to 2¾d., North 2⅜d. to 2⅝d. Heavy oils, in bulk, 3⅛d. Carbolic acid, 60 per cent.,

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 85.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Oct. 11	10½	Alliance & Dublin 10 p.c.	19½—20½	+½	5 2 5
268,324	10	,,	7⅛	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	Oct. 30	7	Bombay, Ltd.	6—6½	−¼	5 7 8
40,000	5	,,	7	Do. New, £4 paid	4½—5	..	5 12 0
50,000	10	Aug. 29	14	Bournemouth Gas & Water { 10 p.c.	27⅞—28¼	..	4 18 3
51,810	10	,,	7	Bournemouth Gas & Water { B 7 p.c.	16½—17	..	4 2 4
53,200	10	,,	6	Bournemouth Gas & Water { Pref. 6 p.c.	14⅜—15⅜	..	3 17 5
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	245—250	+1	5 0 0
500,000	,,	,,	9⅜	Do. New	183—188	+2	5 1 1
50,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	+5	4 0 0
206,250	,,	Dec. 13	4	Do. 4 p.c. Deb.	99—102	+1	3 18 5
220,000	Stk.	Sept. 27	11¼	Brighton & Hove Orig.	200—210	..	5 7 1
246,320	,,	,,	8¼	Do. A. Ord. Stk.	153—158	..	5 4 5
460,000	20	,,	10	British	40⅜—41½	+⅛	4 16 5
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c.	118—121	+1	4 19 2
165,700	,,	,,	4½	Do. do. 3½ p.c.	88—91	+1	4 18 11
500,000	10	Oct. 11	7	Buenos Ayres (New) Ltd.	11—11⅛	+⅛	6 1 9
250,000	Stk.	Dec. 13	4	Do. 4 p.c. Deb.	89—91	..	4 7 11
150,000	20	July 12	8¼	Cagliari, Ltd.	26—27	..	6 2 3
100,000	10	—	—	Cape Town & Dis., Ltd.	6—8	..	—
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.	7—9	..	5 0 0
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	48—50	..	6 0 0
100,000	Stk.	Dec. 30	4½	Do. 4½ p.c. Deb. Stk.	52—91*	..	4 15 9
157,150	Stk.	Aug. 15	5	Chester 5 p.c. Ord.	108—110	..	4 10 11
1,443,280	Stk.	,, 29	5⅛	Commercial 4 p.c Stk.	102—107	+2	4 17 2
560,000	,,	,,	5	Do. 3½ p.c. do.	100—105	+2	4 15 3
475,000	,,	Dec. 13	3	Do. 3 p.c. Deb. Stk.	80—82	..	3 13 2
800,000	Stk.	,,	6½	Continental Union, Ltd.	106—111	..	5 17 1
200,000	,,	,,	7	Do. 7 p.c. Pref.	135—140	..	5 0 0
460,170	Stk.	—	5½	Derby Con. Stk.	122—123	..	4 9 5
55,000	,,	—	4	Do. Deb. Stk.	105—105	..	3 16 2
480,090	10	July 31	12	European, Ltd.	22½—23½	..	5 2 2
3⁵⁄₁₂,060	10	,,	12	Do. £7 10s. paid	16½—17½	..	5 2 10
15,182,590	Stk.	Aug. 15	4⅛	Gaslight and Coke { 4 p.c. Ord.	97⅝—98½	+1¼	4 9 4
2,600,000	,,	,,	3⅜	Gaslight and Coke { 3⅜ p.c. max.	86—88	..	3 19 7
3,799,735	,,	,,	4	Gaslight and Coke { 4 p.c. Con. Pref.	103—106	+1	3 15 6
4,193,975	,,	Dec. 13	3	Gaslight and Coke { 3 p.c. Con. Deb.	81—83	..	3 12 3
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	93—98	..	5 2 0
82,500	,,	,,	6½	Do. do. 5 p.c.	114—117	..	5 11 1
70,000	10	Oct. 11	11	Hongkong & China, Ltd.	19—20	..	5 10 0
4,940,000	Stk.	Nov. 14	8	Imperial Continental	175—178	+4	4 9 11
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	92—94	+1	3 14 6
195,242	Stk.	Aug. 29	6	Lea Bridge Ord. 5 p.c.	110—120	..	5 0 0
306,083	,,	Dec. 30	4	L'rpool Unit'd Deb. Stk.	106—108*	..	3 14 1
561,000	Stk.	Aug. 29	10	Liverpool United A	222—224	+2	4 9 3
718,100	,,	,,	7	Do. B.	158—160	..	4 7 6
152,736	Stk.	Feb. 14	7⅞	Maidstone 5 p.c.	140—145	..	5 5 2
75,000	5	Nov. 28	5	Malta & Medn., Ltd.	4—4½	..	5 11 1
560,000	100	Oct. 1	5	Met. of { 5 p.c. Deb.	100—102	+1	4 18 0
250,000	100	,,	4½	Melbourne { 4½ p.c. Deb.	100—102	..	4 8 3
541,920	20	Nov. 14	3½	Monte Video, Ltd.	10½—11½	..	6 1 9
1,775,892	Stk.	Aug. 15	4⅝	Newc'tle & G'tesh'd Con.	106—108	+1	4 5 8
406,025	Stk.	Dec. 30	3½	Do. 3½ p.c. Deb.	86—88*	..	3 19 7
15,000	10	Aug. 29	10	North Middlesex 10 p.c.	19½—20½	..	4 17 7
55,940	10	,,	7	Do. 7 p.c.	13—14	..	5 0 0
300,000	Stk.	Nov. 28	8	Oriental, Ltd.	135—138	..	5 15 11
60,000	5	Sept. 13	7	Ottoman, Ltd.	6—6½	..	5 7 8
398,490	5	Oct. 30	7	Primitiva Ord.	6⅝—7¼	+¼	4 16 7
796,980	5	July 31	5	Do. 5 p.c. Pref.	4½—5⅜	..	4 17 7
488,900	100	Dec. 2	4	Do. 4 p.c. Deb.	92—94	..	4 5 1
1,000,000	10	Oct. 11	8	River Plate Ord.	13½—13¾	+¼	5 16 5
312,650	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	92—94*	+2	4 5 1
250,000	10	Sept. 27	8	San Paulo, Ltd.	13—13½	..	5 18 6
125,000	50	Jan. 2	5	Do. 5 p.c. Deb.	46—48*	..	5 4 2
135,000	Stk.	Sept. 13	10	Sheffield A	244—246	..	4 1 4
209,984	,,	,,	10	Do. B	244—246	..	4 1 4
523,500	,,	,,	10	Do. C	244—246	..	4 1 4
70,000	10	Nov. 14	10	South African	14½—15½	..	6 9 0
6,429,895	Stk.	Aug. 15	5⅝	South Met., 4 p.c. Ord.	122—125	+2	4 8 0
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	82—84	+1	3 11 5
201,720	Stk	Sept. 13	8	South Shields Con. Stk.	154—156	..	5 2 7
605,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	116—119	+2	4 12 5
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—123	+3	4 1 4
117,058	,,	July 12	5	Do. 5 p.c. Deb. Stk.	122—127	+2	3 8 9
502,310	Stk.	Nov. 14	5	Southampton Ord.	104—109	..	4 11 9
120,000	Stk.	Aug. 15	6⅔	Tottenham and { A 5 p.c.	120—123	..	5 9 9
398,940	,,	,,	5¼	Tottenham and { B 3½ p.c.	100—103	..	5 1 11
149,470	,,	Dec. 13	4	Edmonton { 4 p.c. Deb.	97—100	..	4 0 0
182,380	10	Dec. 30	8	Tuscan, Ltd.	1⅝—2⅜*	..	7 8 10
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	98—100*	..	5 0 0
193,742	Stk.	Aug. 29	5	Tynemouth 5 p.c. max.	107—109	..	4 11 9
30,000	Stk.	Feb. 14	8	Wandsworth and { A 5 p.c.	—	..	—
255,636	,,	Aug. 15	6⅔	Wandsworth and { B 3½ p.c.	128—133	..	4 17 9
75,000	,,	,,	5⅜	Wandsworth and { C 3½ p.c.	—	..	—
80,075	,,	Dec. 30	3	Putney { 3 p.c. Deb. Stk.	73—7⅝*	..	3 16 11
845,872	,,	Aug. 15	5⅜	West Ham 5 p.c. Ord.	101—104	+1	4 19 6
185,000	,,	,,	5	Do. 5 p.c. Pref.	118—120	..	4 3 4
228,300	,,	Dec. 30	4	Do. 4 p.c. Deb. Stk.	102—107*	+4	3 14 9

Prices marked * are "Ex div."

casks included, east coast, 1s. 6¾d. to 1s. 7¼d., west coast 1s. 6d. to 1s. 6¾d. Naphthalene £6 10s. to £12 10s.; salts, 42s. 6d. to 47s. 6d., packages included and f.o.b. Anthracene, "A" quality, 1½d. to 1¾d. per unit, packages included and delivered.

Sulphate of Ammonia.

This article is somewhat firmer, though there is not much business doing. The principal gas companies quote £12 5s., and outside makes are fetching £11 15s. to £11 17s. 6d. In Hull, the market price may be taken as £11 16s. 3d. to £11 17s. 6d.; and in Liverpool at £11 17s. 6d. to £11 18s. 9d. In Leith, the prices are £12 1s. 3d. to £12 2s. 6d.

COAL TRADE REPORTS.

Lancashire Coal Trade.

Lancashire coalowners report that they are as busy as they can be in meeting the demands of customers for all classes of coal. Owing to the Christmas and New Year holidays, all stocks, where any existed, were cleared out. Literally, the supply is not equal to the demand. Domestic requirements are much stronger; and a good trade is done with shipping in the Canal. Gas companies and gas committees are pressing for deliveries of coal and cannel under contract. Odd lots of gas coal are also being disposed of. The average list of prices at the Manchester and district pits has not yet been altered from those last published; nor does it seem to be expected that any change will be made at present. It is admitted that the rise of 6d. per ton in the Wigan district has enhanced the general demand at other pits in the county where quotations have not yet been interfered with.

Northern Coal Trade.

There is a steady demand for coal; but the shipments have been interfered with in some degree by the inclement weather. Steam coals are in good demand. Best Northumbrian kinds are from about 13s. to 13s. 6d. per ton f.o.b., second-class steams are 12s. 3d. to 12s. 6d., and steam smalls are quiet at 6s. 6d. to 7s. The collieries are now working well; and there is a normal output. In the gas coal trade, the demand is full, both locally and for export; and prices are steady, though they vary a good deal—Durham gas coals being quoted from about 12s. 6d. to 14s. 6d. per ton f.o.b. for early delivery, with some concession for forward delivery. As to contracts, it may be said the expectation is that the large Copenhagen gas coal contracts are likely to be fixed at prices between those paid last year and the current ones. Some other smaller season contracts are in negotiation, with prices asked near the current one's rates; but it is probable that any prolonged period of keen weather might stiffen the market. In coke, the trade seems steadier; but gas coke is plentiful, and the quotations vary from about 18s. 6d. to 19s. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

Business this year as yet has been very slow, and small. There is a plethora of small stuff in the market, which is affecting other sorts, and, besides, there is a disposition on the part of buyers to hold off as much as they can, in the expectation of getting easier terms. The prices quoted are: Ell 13s. to 14s. 6d. per ton f.o.b. Glasgow, splint 14s. to 14s. 6d., and steam 12s. 6d. to 12s. 9d. The shipments for the week amounted to 110,463 tons—a decrease of 197,403 tons upon the previous week, but an increase of 17,645 tons upon the corresponding week of last year.

Gas Displacing Electricity in Poplar.—The Electrical Engineer of the Poplar Borough Council reported at the last meeting that only one licensed house out of 351 in the borough is taking current exclusively for lighting. Recently some long-hour consumers had discontinued the use of electricity, and had reverted to gas. He urged that something should be done to remedy this state of things. The Council resolved to offer better terms, so as to attract this class of consumer.

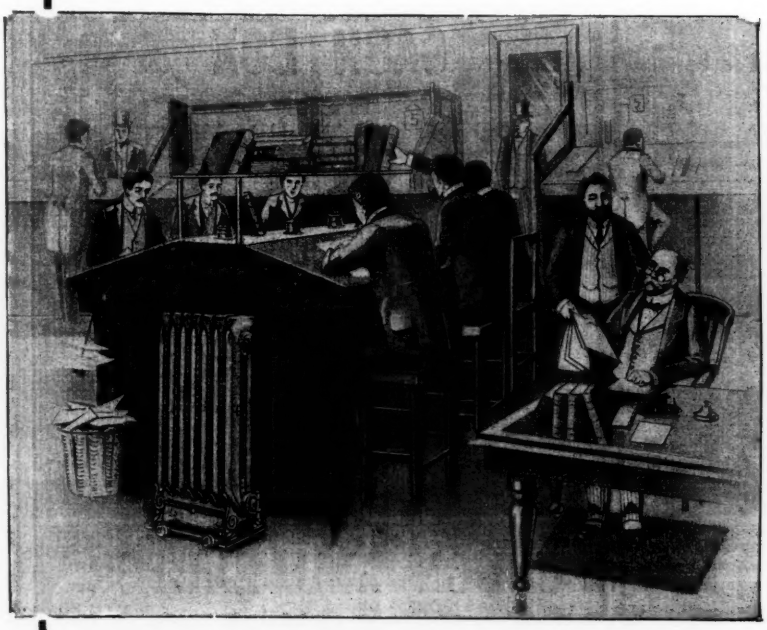
Gas Supply for Barnham.—The Bill promoted by the Bognor Gas Light, and Coke Company, proposing to include Barnham in the area of supply, was considered at a parish meeting last Wednesday. Mr. W. A. Hounsom, J.P., presided, and explained the features of the Bill, so far as it affects Barnham. He said the standard price of gas would be 4s. 3d. per 1000 cubic feet, but it would be liable to increase or decrease according to the dividend paid by the Company. The principal point, he thought, was that they should insist upon having the gas brought to the district within a reasonable time. The Aldingbourne Parish Council had suggested a conference of representatives from the Aldingbourne, Eastergate, Barnham, and Yapton parishes to consider the subject. The meeting agreed with this view, and the Chairman, with two other gentlemen, was appointed to represent Barnham.

Oswestry Water Supply.—At the meeting of the Oswestry Town Council on Monday last week, it was announced that an agreement had been entered into for obtaining a supply of water for the borough from the Liverpool Corporation. The scheme is to draw the water from above the intake of the Liverpool reservoir, and discharge it either into the Council's reservoir or direct into their mains. It was stated that the cost would not exceed the £1200 estimated. Under the agreement, the Council will be free to take any quantity of water up to 250,000 gallons a day; the price to be paid being 6d. per 1000 gallons, as stipulated in the Act of Parliament. It was mentioned that both the Liverpool Corporation and Lord Harlech, over whose land the necessary connecting-pipes will be laid, had met the Council most fairly, and had done all they could to help them. Alderman Perks, who moved the confirmation of the minutes of the Water Committee bearing upon this subject, said it was a pleasure to introduce it to the Council owing to the businesslike way in which the Corporation and his Lordship had met them. This was also testified to by Alderman Spaull, a member of the Committee. The motion was adopted.

RADIATOR PICTURES

(continued).

OFFICE HEATING.



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Shoolbred & Co., London.
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Liberty's, Regent Street, London.
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WRIGHTS THE RADIATOR PEOPLE.

Death from Lead Poisoning at Ravensthorpe.

At an inquest on a Ravensthorpe insurance agent named Midwood, aged 40, the widow said her husband had been in the habit of drinking a lot of water from the tap. A water inspector stated that the water for Ravensthorpe was obtained from the Dewsbury and Heckmondwike Water Board. It was very soft, and acted more quickly than hard water upon the lead in the pipes. He had heard of several cases of lead poisoning in the district, but not of any fatality. People had been recommended to let the taps be open for a time before using the water. The question of lead piping had not been before the Council that he knew of; and builders could put in any length of such piping they thought fit. Dr. Scholefield said he found deceased in severe convulsions and unconscious, with partial paralysis on the right side. There was a well-marked blue line on the gums. On making a post-mortem examination, he discovered pronounced evidence of lead poisoning. He attributed death primarily to lead poisoning, and secondarily to kidney disease. He found lead in the water. The Coroner said the water was perfectly pure; but being soft, it absorbed lead very easily from lead pipes. The lesson to be learnt was that people who had lead pipes should always, before using the water for drinking purposes, open the tap for a considerable time. The Jury returned a verdict in accordance with the medical evidence.

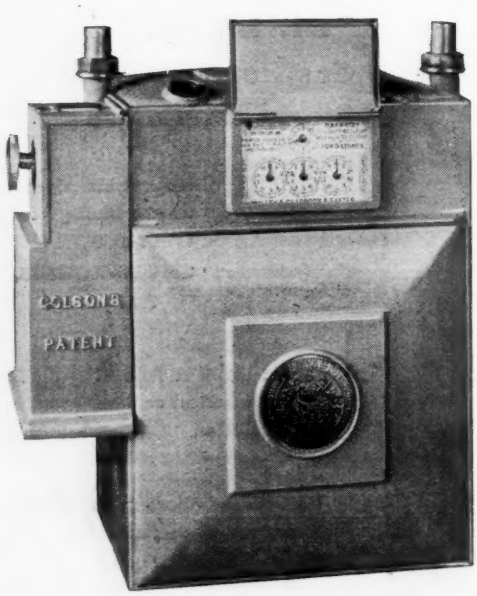
Automatic Street Lighting Experiment in Lambeth.—At the meeting of the Lambeth Borough Council last Thursday, the Lighting Committee brought up a report with regard to the experiment which the Gaslight and Coke Company are making in automatically lighting and extinguishing the public lamps, to 170 of which the apparatus has been fixed. The Company offered to extend the system to all the lamps; but the Committee are not yet in a position to say whether the offer should be accepted. They have given permission for the experiment to be continued until they are ready to report to the Council.

Coggeshall and a Water Supply.—Mr. F. H. Tulloch last week held a Local Government Board inquiry into an application for sanction to borrow £460 and £40 for experimental works of water supply for the parishes of Great and Little Coggeshall respectively. It was stated that the number of houses in Great Coggeshall was 695, of which 650 would come within the area of the proposed scheme; and of 76 houses in Little Coggeshall, some 50 would be within the area. Dr. Thresh (Medical Officer of Health for the County) said in his opinion the supply of water to Coggeshall was very bad. In the whole county of Essex there were only four towns with a population of over 2000 inhabitants that had not a proper water supply; and Coggeshall was one of them. He considered a proper water supply was not only desirable, but essential. Dr. Young (Medical Officer of Health to Braintree) expressed entire agreement with Dr. Thresh. A good deal of opposition was offered to the proposal.

Fatal Fumes from a Gas-Stove at Leeds.

The Leeds City Coroner last Tuesday held an inquest respecting the death of George Smith (17), son of a caretaker, who was suffocated by fumes from a gas-stove in his bedroom. William Smith, the father of the deceased, described the fixing of the stove, and said the fireplace was blocked up with thin boards, leaving a space open near the floor. On the hearth-stone was the gas-stove, fixed to a pipe from the gas-bracket. On the preceding Sunday morning, witness heard noises, and went to the room where his sons slept. There was a nasty smell in the bedroom; but the stove was not burning. He then described how he found his sons—one lying on the floor, and the other crouched in a corner. He tried artificial respiration on George, but without success. Arthur Smith, brother of the deceased, said he heard George fall out of bed in the early hours of Sunday morning. He got up, and put him back into bed. Later, he heard George shout; and, in the semi-darkness, he could just see him lying full length on the bedroom floor. Witness lit a candle at the gas-stove, which was then burning all right; and he afterwards put out the stove. He remembered no more, as he himself became unconscious. He noticed no smell; but the room was warm. Dr. E. A. Wilson said that when he saw the deceased he appeared to have been dead about half-an-hour. He was satisfied that the lad was poisoned by fumes produced by the imperfect combustion of coal gas. The Coroner remarked that the down-draught from the chimney, acting upon the gas-stove, might have led to imperfect combustion, and given rise to the gases which had proved fatal in this case. The Jury returned a verdict of "Accidental death."

Bilston Gas Company.—The annual general meeting of this Company was held on Monday last week—Mr. Harold Holcroft in the chair. The Directors reported that there had been an increase of 4·14 per cent. in the sales of gas, and that after paying the interim dividend there was a balance of £8022. It was proposed to pay further dividends of 5s. 6d. and 4s. per share on the "A" and "B" shares (making 11s. and 8s. for the year), which would leave a balance of £5377. The Chairman, in moving the adoption of the report, said the chief interest attached to it was in a record increase of something rather more than 4 per cent. in the sales of gas. In the face of competition of various kinds, this should be regarded as satisfactory, seeing that the population in the Company's area of supply was not a rapidly increasing one. There had been an upward movement in the price of coal; but this was to be expected, considering the repeated advances in wages, and the constant additional charges placed on mineowners by Acts of Parliament. Sales of coke had been effected at rather higher prices; but, on the other hand, residuals had realized less. Unusual expenditure had been incurred owing to leakage from the mains. At an early date, the Company would have to face some rather heavy renewals of plant. Alderman J. Jones seconded the motion, and it was carried.



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Proposed Increase of Water-Rates at Fulwood.

A Local Government Board inquiry was held by Mr. F. J. Willis, in the offices of the Fulwood Urban District Council, last Wednesday, in regard to an application by the Council for authority to increase or vary the rates for the supply of water for domestic purposes within their area. The Clerk to the Council (Mr. Arnold Brierley) explained that there was a debt of £38,045 in respect of the water undertaking. A rate of 1d. in the pound on the assessable value of the district produced £101 4s. 8d.; and if they included Government property, it came to £112 4s. 8d. There was a deficiency on the water undertaking which at present could only be made good out of the rates. The Council wished to make the undertaking self-supporting; and his instructions were to submit a revised scale of charges, with the object of having them authorized by the Local Government Board. He had gone into the matter of the assessments; and if the scale were sanctioned, there would be an aggregate increase of £532 on the whole of the assessments. Mr. Brierley then handed to the Inspector a tabulated statement, in which, he said, he had not shown any rateable value higher than £80, for there were very few houses over this amount. There were 39 premises in the district not exceeding £5 rateable value, 75 between £5 and £7 10s., 107 between £7 10s. and £10, 784 between £10 and £30, and 131 over £30. Mr. James Clarke, the Clerk to the Preston Rural District Council, said he thought the charges proposed were excessive, and out of proportion to those of the Preston Corporation. The Inspector pointed out that this was a water-supply scheme on a more extensive scale. Other observations on the proposal having been made, the inquiry closed.

Water-Works Extensions at Wellingborough.—At the meeting of the Wellingborough Urban District Council last Tuesday, the Highway, Lighting, and Water Committee reported that they had considered a specification and estimates for softening and filtering plant at the Bushfields works, amounting altogether to £3600; and they recommended that the scheme should be adopted, and the sanction of the Local Government Board to a loan of £3650 for carrying it out applied for. The recommendation was adopted.

Proposed Extension of the Braintree Water-Works.—At their last meeting, the Braintree Urban District Council considered a scheme for a considerable extension of the water-works, at an estimated cost of £6000 or £7000; but only a section has been settled for immediate carrying out. This will involve an outlay of about £3000, and embrace the deepening of one of the two artesian wells, the fixing of new pumps and a suction gas-engine, the enlargement of the tanks, and some minor improvements in the service. It is believed that the saving effected in the consumption of fuel in pumping will almost, if not quite, pay the instalments on a loan for the purpose, as at present pumping has to be carried on continuously night and day, whereas ten hours a day will be ample under the new system.

Slough District Council and the Water-Works.—As already announced in the "JOURNAL," the Slough Urban District Council have given notice of their intention to promote a Bill next session to authorize them to acquire the undertaking of the Slough Water Company. The proposal was brought before the ratepayers at the usual statutory meeting last Wednesday, and was agreed to with one dissentient.

Death in the Glasgow Gas Office.—Last Thursday, Mr. Robert Bryan, one of the meter surveyors in the Glasgow Gas Department, died in the gas office. He had come on duty and was signing his name, when he dropped down dead. Mr. Bryan was 57 years of age. He had been for thirty years in the gas service, having been taken over by the Corporation when they acquired the undertaking of the Partick, Hillhead, and Maryhill Gas Company. The funeral on Saturday was largely attended; the company including all the chiefs of the Gas Department, a numerous representation of the Maryhill Lodge of Freemasons, of which Mr. Bryan was a Past Master, and many of the general public.

Frost and the Devonport Water Supply.—In consequence of the frost which has prevailed during the past week or two, the leat by means of which Devonport obtains its supply of water has been so blocked with ice and snow, to clear which several attempts have been made, that on the 3rd inst. the Water Committee of the Corporation arranged for a supply from the Plymouth mains. Even with this aid it was found impossible to maintain a constant service, and last Sunday week notice was issued that the water would be turned off at 3 p.m. next day until 7 a.m. on Tuesday, and so daily until the leat again afforded an ordinary supply. Monday morning, however, found the reservoir practically empty; and the supply was discontinued after 10 a.m. Only a partial supply was furnished during the rest of the week. On Thursday, when the thaw had restored the leat to its normal condition, the full service was resumed. Meanwhile, work is proceeding with the laying of the pipe-line which is to take the place of the leat, and will, it is hoped, obviate any such troubles in future winters.

Rainfall in the Elan Valley.—The Secretary (Mr. Antony Lees) has presented to the Birmingham Water Committee a table of comparative figures relating to the rainfall during the past year at the Witton and Whitacre stations, and also in the Elan Valley. At the former place, the total rainfall in 1907 was 27·80 inches, at Whitacre 28·91 inches, and in the Elan Valley 61·36 inches. Compared with the average fall for the ten years ended Dec. 31 last, these totals show little or no difference in the Elan Valley, but an increase of 3·27 inches at Witton and 2·76 inches at Whitacre. The average figures were: Witton, 24·53 inches; Whitacre, 26·15 inches; Elan Valley, 61·32 inches. In 1906, the amount of rain at Witton was 24·54 inches, and at Whitacre 24·98 inches; while in 1905, the totals were as low as 19·67 inches and 21·61 inches respectively. While, therefore, locally the past year was abnormally wet, the season was an average one in the Valley of the Elan, where during the past ten years the highest fall recorded was 87·14 inches in 1903, and the lowest 50·94 inches in 1902.

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Coal Tar in Milk.—Coal tar in Liverpool has been put to a use which is not generally mentioned among the many purposes for which it is so eminently suited. Some days ago, a tradesman appeared at the local Police Court to answer an accusation of selling adulterated milk. It was stated that water had been added to the milk; and then (no doubt to change the resultant bluish appearance to a nice creamy tint) the mixture had been coloured with coal-tar dye. The Magistrate's acknowledgment of this enterprise was a fine of £3 and costs.

Suicide by Illuminating Gas Poisoning.—In a case in which a man committed suicide by gas poisoning in the bathroom of his house at Upper Clapton, the Coroner (Dr. Wynn Westcott) suggested to the Jury that they might say death was due to "illuminating" gas. He pointed out that such cases used to be called coal-gas poisoning; but now water gas entered largely into the manufacture of gas, and made it much more poisonous. He added—though apparently without quoting any figures to demonstrate it—that "in consequence cases of gas poisoning were far more common now than they were ten years ago." The Jury acted on the suggestion.

Fermoy in Darkness.—According to the "Freeman's Journal," the town of Fermoy presented last Wednesday night a desolate appearance, owing to the absence of gaslight. During the morning the workmen of the Gas Company made another attempt to open a road for the purpose of repairing a broken gas-main. Operations were carried on for a time; but they had to be abandoned before the pipe was reached, in consequence of the opposition offered by the officials and workmen of the Urban District Council. The public lamps (numbering about 100), the shops, and public institutions were lighted as usual; but shortly afterwards the gas on the northern side of the town gave out, leaving the district in utter darkness. At about half-past six nearly the entire town was in a similar plight.

New Joint-Stock Companies.—The Sulphate of Ammonia Company, Limited, has been registered with a capital of £125,000, in £1 shares, to adopt an agreement made between the Chemicals Proprietary Company, Limited, and the Liquidator of the first part, Chemicals Limited, and the Liquidator of the second part, and the new Company of the third part, and to carry on the business of manufacturers of ammonia and compounds and salts of ammonia, sulphuric, nitric, and acetic acids, acetone, acetate of lime, salts, tar, naphtha, paraffin wax, or other products of the destructive distillation of carbonaceous materials, water and producer gas, coal gas, alkalies, and alkaline salts, charcoal, coke, chemicals, &c. There will be no initial public issue. Firth Blakeley, Sons, and Co. is the title of a Company which has been registered with a capital of £15,000, in £1 shares (500 preference), to take over the business of gas, water, and general engineers carried on by Messrs. J. Firth Blakeley and Co., at Thornhill Lees, Dewsbury. There will be no initial public issue. Under the title of Duplex Radiators, Limited, a Company has been formed, with a capital of £15,000, to take over the business which has for the past two seasons been conducted by Mr. C. J. Morehouse at No. 37, Southampton Row, W.C.—one of the Directors. There will be no initial public issue.

Strange Sequel to a Case of Suffocation by Gas.—The Brussels Correspondent of the "Daily Mail," writing last Tuesday, told a very curious story in connection with the death of M. Delporte, which had recently taken place at Chimay owing to an escape of gas. It formed a remarkable sequel to, and explanation of, the death of his wife in the same place last November, when the overpowering odour of chrysanthemums in a closed room was thought to have been the cause. Not only was M. Delporte found suffocated by the escape from the street main, but sixteen other persons in the neighbourhood suffered severely. The gas percolated into the cellars of the houses, the doors and windows of which, owing to the intense cold, had been rigorously closed, and the air became gradually contaminated.

Water-Works Extensions at Bridlington.—In the course of a Local Government Board inquiry into an application by the Bridlington Town Council for sanction to borrow £11,500 for the provision of new plant and buildings at the water-works, the Consulting Engineer (Mr. F. J. Bancroft) said that the existing plant was antiquated, defective in design, and incapable of giving a full supply; and it was liable to break down under pressure. He estimated that the saving in coal and labour would almost cover the new loan charges. Alderman Bennett and Councillor Stevenson opposed the application, contending that the present works were equal to the demand made upon them. The Town Clerk said there had been a profit on the works of about £500 a year.

Mansfield to Oppose the Lincoln Water Bill.—At a special meeting of the Mansfield Town Council, held to consider the Lincoln Corporation Water Bill, Alderman Alcock, the Chairman of the Water Committee, proposed a resolution to the effect that, in the interests of the inhabitants, it was expedient to oppose the measure; and this was adopted. The Council, in committee, after thoroughly discussing the matter, had previously arrived at the same conclusion. Several members seemed desirous of learning what the cost would likely be; but the Town Clerk said that "matters of this kind could be very well explained after the Press had retired," which led to the retort that there was a lot too much excluding of the Press. The Town Clerk, however, pointed out that so far the Council were only committing themselves to presenting a petition against the Bill.

Defective Gas-Chandeliers.—A somewhat severe gas explosion took place on Monday of last week at Newcastle-on-Tyne, in consequence, it is said, of a defective chandelier. Mr. Martin, the occupier of the house, struck a light in the front room and a violent explosion ensued, which broke the windows all over the house, damaged the furniture and walls, and blew part of the roof off. Mr. Martin was burnt; and the other occupants of the house had narrow escapes from injury. Apparently a somewhat similar accident at Southend owed its origin to a like fault. After a Mr. Zimmerman had retired to bed, he heard a rumbling noise in the dining-room, where hung a gas-chandelier. Proceeding to investigate, and striking a light, an explosion followed. The bay window was blown out, the whole of the glass and ceilings were wrecked, and the premises were otherwise damaged.

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Grumble from Carnarvon Plumbers.—The Carnarvon Gas Committee received a petition from the plumbers of the town objecting to the Corporation undertaking private gas-fitting work, and the supply of gas burners and brackets. After considering the matter, the Committee decided that, in view of the keen competition of electricity, it was essential, in the interests of the gas undertaking, that the Manager should spare no efforts in demonstrating the advantages of gas for lighting purposes; and to this end he must be prepared to give advice whenever called upon by a private consumer. It was also decided that, with regard to internal alterations, the Manager should refer consumers to their plumbers; but in the event of the consumer being unable to obtain satisfaction from his own plumber, the Manager must do the best he could rather than lose a customer The Committee's views on the subject were approved by the Council.

Chilly Weather and Cheaper Gas.—"With the coal merchants advancing the price of 'households,' and 'barren winter with its wrathful, nipping cold' driving us to a lavish expenditure of fuel, it is good news," says the "Local Government Journal," "for those Londoners who live north of the Thames, in the district of the Gaslight and Coke Company, to learn that the Company have reduced the price of their gas by 1d. per 1000 feet as from the beginning of this quarter. The use of gas-fires in bedrooms (enabling one to have a cosy fire night and morning or to dress by before dinner, without making any work for the servants and at very small cost) is becoming so general since their use was approved and recommended by doctors, that a reduction in the price of gas in the height of the winter season will give widespread satisfaction, except to the coal merchants. Those who have experienced the cheerfulness, convenience, and exceeding comfort of gas-fires in bedrooms look back with wonderment to the days when they were prejudiced against these fires, and cordially endorse the dictum of a London physician that 'everyone in any way delicate, especially on the chest, should have a gas-fire in the bedroom.'"

A Special Sub-Committee of the Manchester Corporation Gas Committee has been appointed to consider an application of the Gas Workers' Union, made through Mr. J. R. Clynes, M.P., the District Organizing Secretary, for an advance of 5 per cent. in wages and additional annual holidays with pay.

We have received from the Carron Company their supplementary catalogue of gas appliances. It contains illustrated particulars of a great variety of cookers, grillers, gas-ovens, hot-plates, portable gas-boilers, &c., which are preceded by some useful observations on the advantages of cooking by gas and directions for the use of the Company's appliances.

Joshua Moore, aged 76, a retired overlooker, who lived alone at Sykes Head, Oakworth, was last week found dead in bed. The deceased's son went to the house, and found the door locked. Fearing that something was wrong, he got a ladder, and on entering by the bedroom window discovered his father lifeless in bed. The room was full of gas; and the tap of the gas-bracket was open. The deceased is said to have had no sense of smell.

The Paddington Borough Council have voted £700 to meet the increased charges of the Gaslight and Coke Company for public lighting in the borough. They have decided to support the Islington Borough Council in an appeal to the Board of Trade for an inquiry into the administration of the Company "with a view to the protection of the public interests, and to prevent further charges being made;" and they have also expressed their opposition to a charge for meter-rents, except in cases where gas is only used as a stand-by.

On the occasion of the recent visit of Her Majesty the Queen of Portugal to Sandringham, it was found necessary to supply dinner *en route*. The royal train in which Her Majesty travelled was not equipped with a kitchen, and the difficulty to be overcome was therefore a somewhat serious one. However, Mr. Amendt, of the Great Eastern Railway Company, was equal to the occasion; and in the space of a few hours he had fitted up in the train a "Main" gas-cooker, by the aid of which he was able to prepare for Her Majesty a full *menu*.

Messrs. Joseph Taylor and Co. have received orders for the relining of two saturators, including ammonia and seal pipes, &c., for the Wigan Coal and Iron Company, Limited. They have also orders from Simon-Carvès Limited for two 5 feet square solid-plate lead saturators, fitted with their improved make of sulphate raisers; four 10-ton lead-lined acid tanks, also a lead-lined mother-liquor tank, &c.; and a further order for exportation for a solid-plate lead saturator, including a 10-ton acid tank, draining-table, &c. Other orders received are for a solid-plate lead saturator, sulphate drainer, mother-liquor tank, &c., for the new sulphate of ammonia plant for the Wallasey Gas Department, a solid-plate lead saturator for the Beverley Corporation Gas Department, and leadwork in connection with coke-oven plants. The total weight of leadwork enumerated in these contracts will be about 60 tons.

In connection with the recent Cray Water-Works Assessment litigation, the Swansea Corporation have decided, in order to get the decision of the Brecon Quarter Sessions reviewed by a Superior Court, to refuse to pay the rate and to contest it in every possible way. The latest development reported is that the Brecon authorities are determined to take drastic steps to compel compliance with the decision of the Quarter Sessions. With this object, they have applied for a summons against the Corporation for non-payment of the rate imposed. This has been made returnable for the 25th inst. at the Brecon Police Court; the amount demanded being £1137 6s. 6d., rates due on the disputed assessment for the half year. Should the Magistrates make an order for payment, it is said to be the intention of the Brecon Assessment Committee to endeavour to enforce it by sealing up the outlet-valve of the works—a course they have been advised they have a legal right to adopt.

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All Communications, Remittances, &c., to be addressed to WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.

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"ILLUMINATING TRUTHS FOR HOUSEHOLDERS."

No. 1.—"The Sanitary Aspects of Gas and Electric Lighting."
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No. 3.—"Fire Risks."
No. 4.—"The Relative Cost of Gas and Electricity, and Matters affecting it."
No. 5.—"On Reliability, with Instances of Misplaced Confidence."
No. 6.—"On Shop Lighting, with Special Reference to the Flame Arc Lamp."

This series of Leaflets will be useful, not only for distribution among Householders generally, but for circulation among Shareholders to fortify them with arguments in defence of the commodity in which they have invested capital. Copies of each Leaflet should also be kept in every Gas Undertaking's Show-Rooms.
Prices for Quantities on Application to WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

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Situations Vacant.

GAS AND WATER ENGINEER AND MANAGER. Goole District Council. Applications by Jan. 27.
GAS MANAGER. Omagh District Council. Applications by Jan. 25.
DRAUGHTSMAN. No. 4890.
TRAVELLER (MOTORS). No. 4896.
TRAVELLER. No. 4898.
HEAD MECHANIC (GAS-WORKS). No. 4889. Applications by Jan. 10.
MECHANIC (NIGERIA). Applications to Crown Agents for the Colonies by Jan. 16.

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REPRESENTATIVE. No. 4869.
MANAGER OR ASSISTANT. No. 4894.

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Plant, &c. (Second-Hand), Wanted.

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